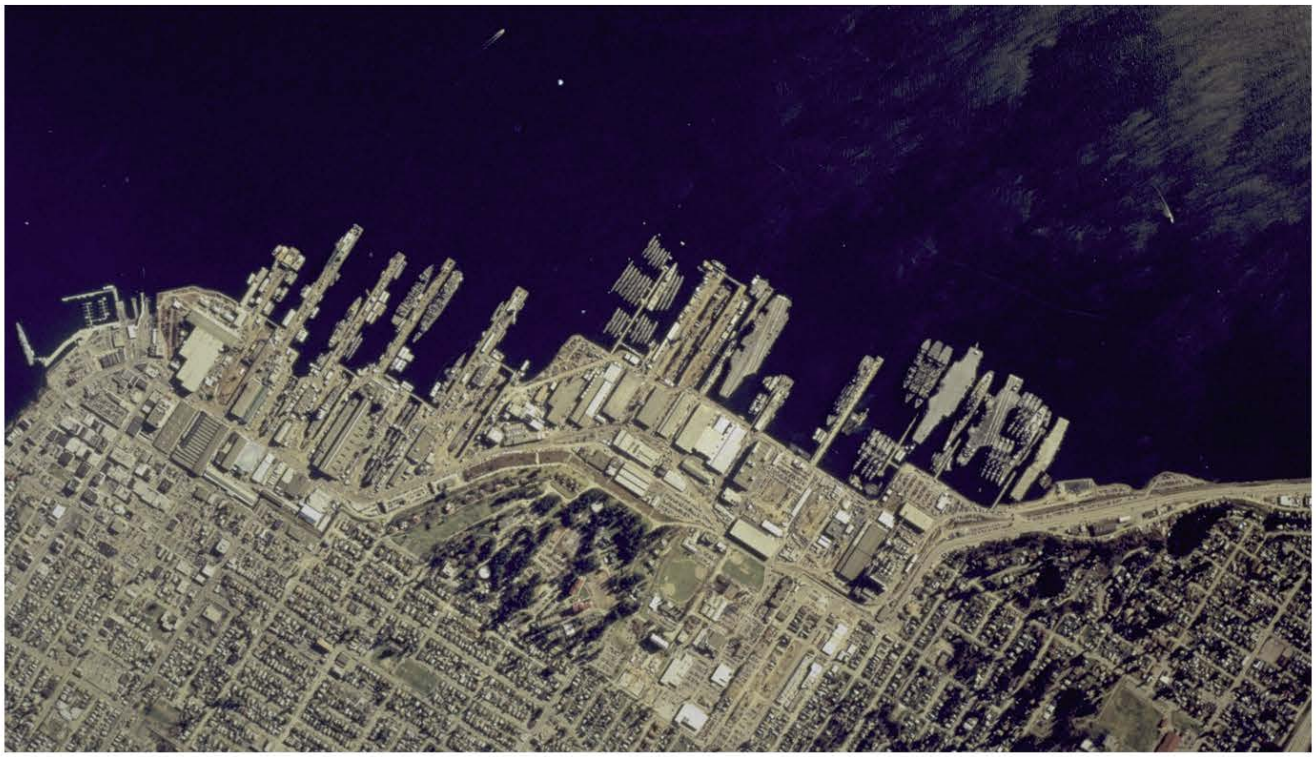
Final
11 November 2016

2014 OU B Marine Phase 2 Long-term Monitoring Report

PSNS Superfund Site

Bremerton Naval Complex
Bremerton, Washington

Department of the Navy
Naval Facilities Engineering Command Northwest
1101 Tautog Circle
Silverdale, WA 98315



FINAL 2014 OPERABLE UNIT B MARINE PHASE 2 LONG-TERM MONITORING REPORT PSNS SUPERFUND SITE BREMERTON NAVAL COMPLEX BREMERTON, WASHINGTON

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Prepared for
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EXECUTIVE SUMMARY

This report documents the results of the final two components of the 2014 long-term marine monitoring performed at Operable Unit (OU) B Marine of the Puget Sound Naval Shipyard (PSNS) Superfund site at the Bremerton naval complex (BNC) in Bremerton, Washington. The results of the primary monitoring tasks carried out in 2014 were documented in a previous report (U.S. Navy 2016). Most of the sampling discussed in this phase 2 report took place in 2015. The 2014 monitoring was the sixth round of long-term monitoring for OU B Marine, following prior rounds in 2003, 2005, 2007, 2010, and 2012. The 2014 monitoring was conducted in accordance with the 2014 OU B Marine Long-term Monitoring Plan (U.S. Navy 2014). The U.S. Navy performed this monitoring to assess and document conditions in Sinclair Inlet subsequent to marine remedial actions carried out between 2000 and 2004 to address sediments contaminated with polychlorinated biphenyls (PCBs) and mercury.

The last two components of the 2014 monitoring, which are the subject of this report, were sampling of subtidal sediment near Charleston Beach at the southwest end of BNC in September 2014 and intertidal sediments at Charleston Beach in May 2015 and sampling of English sole from central Sinclair Inlet in May 2015. The sediments were analyzed for PCBs, eight total metals, including mercury, as well as TOC and grain size. The English sole samples were analyzed for PCBs, mercury, and lipids.

Tables ES-1 and ES-2 present a summary of the Charleston Beach sediment and Sinclair Inlet English sole sample analysis.

Table ES-1
2014-15 Charleston Beach Sediment Sampling

	Fines (Clay + Silt) (%)	TOC (%)	PCBs (µg/kg)	PCBs (mg/kg OC)	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Silver (mg/kg)	Zinc (mg/kg)
SCO/CSL	---	---	---	**12/65**	**57/93**	**5.1/6.7**	**260/270**	**390/390**	**450/530**	**0.41/0.59**	**6.1/6.1**	**410/960**
Natural Background*	---	---	---	---	11	0.8	62	45	21	0.2	0.24	93
Minimum	2.3	0.18	4.3 U	0.12 U	1.4	0.10	8.4	22	5.9 J	0.037	0.045	36
Maximum	31	2.7	140 U**	5.2 U	10	1.5	33 J	160 J	260 J	0.18	0.26	280 J
Mean	7.6	0.81	***	***	3.3	0.40	14	47	51	0.065	0.091	81

Notes:
A total of six sediment samples were collected, one subtidal sample collected in September 2014 and five intertidal samples collected in May 2015.
U - undetected
J - estimated value
µg/kg - microgram per kilogram
mg/kg - milligram per kilogram
SCO/CSL – Washington State sediment cleanup objective/cleanup screening level (new term replaced former "SQS" in connection with publication of Sediment Cleanup User's Manual II [Ecology 2015]).
* - 90/90 upper tolerance level (UTL) values calculated from "BOLD Plus" data and presented in Ecology's Sediment Cleanup User's Manual II (Ecology 2015). A natural background value of 0.0000002 mg/kg was calculated for bulk PCBs, but since this was based on analyses for congeners it is not directly comparable to the Aroclor values presented here.
** - Single elevated detection limit likely caused by matrix interference. This does not impair data usability but does impact use of this value for regulatory comparison (see Data Quality Assessment in Appendix B).
*** - PCBs were not detected in any of the sediment samples.

Table ES-2
2015 English Sole Tissue Sampling

	Mercury (mg/kg wet)	PCBs (mg/kg wet)	Lipids (%)
Minimum	0.030	0.017 J	0.23
Maximum	0.046	0.043 J	0.61
Mean	0.037	0.030	0.46

Notes:

J - estimated value

A total of six English sole samples were prepared; three 20-fish composites and three 19-fish composites.

The key Charleston Beach sediment sample findings are as follows:

- **PCBs.** PCBs were not detected in any of the six samples.
- **Mercury.** Mercury was detected in all six samples, at concentrations ranging from 0.037 to 0.18 mg/kg.
- **Other Metals.** The metals arsenic, cadmium, chromium, copper, lead, silver, and zinc were all detected in all six samples.

The key English sole findings are as follows:

- **PCBs.** PCBs were detected in all six samples, at concentrations ranging from 0.017 to 0.043 mg/kg on a wet weight basis. The average PCB concentration was 0.030 mg/kg, wet weight. For comparison, the average English sole PCB concentrations in prior similar sampling included in the 2003, 2007, 2010, and 2012 long-term monitoring (LTM) rounds were 0.11, 0.033, 0.033, and 0.068 mg/kg, wet weight.
- **Mercury.** Mercury was detected in all six samples, at concentrations ranging from 0.030 to 0.046 mg/kg, wet weight. The average mercury concentration was 0.037 mg/kg, wet weight. The average English sole mercury concentrations in the 2003, 2007, 2010, and 2012 LTM rounds were 0.044, 0.025, 0.056, and 0.048 mg/kg, wet weight.

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DOCUMENT IDENTIFICATION

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ABBREVIATIONS AND ACRONYMS

AWA arithmetic mean	area-weighted average arithmetic mean
AWA geometric mean (geomean)	area-weighted average geometric mean (geomean)
BNC	Bremerton Naval Complex
CAD	confined aquatic disposal
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	chemical of concern
CSL	Washington State sediment cleanup screening level
Ecology	Washington State Department of Ecology
ENR	enhanced natural recovery
EPA	U.S. Environmental Protection Agency
ESD	explanation of significant differences
FS	feasibility study
Hg	mercury
LTM	long-term monitoring
mg/kg	milligram per kilogram
mg/kgOC	milligram per kilogram of organic carbon
µg/kg	microgram per kilogram
MCUL	minimum cleanup level
MLLW	mean lower low water
MTCA	Model Toxics Control Act
NAVFAC NW	Naval Facilities Engineering Command Northwest
Navy	U.S. Navy
NBK at Bremerton	Naval Base Kitsap at Bremerton
NPL	National Priorities List
NSB	Naval Station Bremerton
OC	organic carbon
OU	operable unit
PCB	polychlorinated biphenyl
PSEMP	Puget Sound Ecosystem Monitoring Program
PSDDA	Puget Sound Dredged Disposal Analysis
PSNS & IMF	Puget Sound Naval Shipyard and Intermediate Maintenance Facility
RA	remedial action
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation

ABBREVIATIONS AND ACRONYMS (Continued)

ROD	record of decision
RPD	relative percent difference
SARA	Superfund Amendments and Reauthorization Act
SCO	Washington State sediment cleanup objective
SOAL	State-owned aquatic land
SQS	Washington State sediment quality standard
TOC	total organic carbon
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency

1.0 PROJECT BACKGROUND

This marine monitoring report presents the results of the final two environmental monitoring tasks performed as part of the 2014 long-term monitoring for Operable Unit (OU) B Marine in Sinclair Inlet, adjacent to the City of Bremerton, Washington (Figure 1-1). This was the sixth round of ongoing monitoring being performed by the U.S. Navy (Navy) to document post-remedial action (RA) conditions in the inlet subsequent to a marine cleanup performed by the Navy. As documented in the Record of Decision (ROD) for OU B Marine (U.S. Navy, Ecology, and USEPA, 2000), the Navy undertook this marine cleanup under the Installation Restoration Program in accordance with Executive Order 12580's delegation of responsibility and authority for implementation of the 1980 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986.

OU B Marine, the marine area addressed in the cleanup, is adjacent to land occupied by two separate Navy commands: Puget Sound Naval Shipyard and Intermediate Maintenance Facility (PSNS & IMF), Bremerton site, and Naval Base Kitsap at Bremerton (NBK at Bremerton) (Figure 1-2). The collective area occupied by these two Navy commands is identified on the National Priorities List as the PSNS Superfund Site, but is hereafter collectively referred to in this report as the Bremerton naval complex (BNC).

This monitoring report was prepared by URS Group, Inc. (URS) for the Navy's Naval Facilities Engineering Command Northwest (NAVFAC NW) under Contract N44255-09-D-4001.

1.1 PROJECT SETTING

The primary role of NBK at Bremerton is to serve as a deep-draft home port for aircraft carriers and supply ships. Facilities on NBK at Bremerton property include six piers and moorings, the steam plant, parking, housing, shopping, recreation, and dining facilities for military personnel and their families. NBK at Bremerton also serves as host to several tenant commands including the Naval Inactive Ships Movement Office, which is responsible for providing long-term care of inactive naval vessels, and the Fleet and Industrial Supply Center, which provides material acquisition and warehouse services to west coast Navy commands. NBK at Bremerton occupies the western portion of the naval complex and is a fenced, secure area.

The primary role of PSNS & IMF is to provide overhaul, maintenance, conversion, refueling, defueling, and repair services to the naval fleet. PSNS & IMF has capabilities to drydock and maintain all classes of Navy vessels and is the nation's sole nuclear submarine and ship recycling facility. PSNS & IMF has six drydocks, seven piers and moorings, and numerous industrial

shops to support its industrial operations. Like NBK at Bremerton, PSNS & IMF is host to many tenant commands. PSNS & IMF occupies the eastern portion of the naval complex and is a fenced high-security area.

OU B Marine is one of six operable units at the naval complex (Figure 1-2). It lies primarily within the subtidal zone of Sinclair Inlet and extends up to 1,500 feet offshore from the terrestrial portions of the naval complex. A limited intertidal area is present at Charleston Beach in the southwestern portion of the complex. The sea floor in the deepest portions of OU B Marine lies approximately 40 feet below mean lower low water (MLLW). OU B Marine contains approximately 230 acres of subtidal land. However, the marine monitoring project site extends beyond OU B Marine to include all of Sinclair Inlet.

1.2 PURPOSE OF CLEANUP ACTION

1.2.1 Cleanup Objectives

The need for remedial action in OU B Marine was described in detail in the ROD for OU B Marine published in June 2000 (U.S. Navy, Ecology, and USEPA 2000). The primary basis for the cleanup of OU B Marine was that levels of polychlorinated biphenyls (PCBs) measured in the tissues of bottom-dwelling fish were projected to pose an unacceptable risk to subsistence seafood consumers. The PCBs found in fish tissues are believed to have resulted from consumption of prey species impacted by contamination in marine sediments. A secondary consideration in the cleanup was the presence of elevated levels of mercury measured in rockfish collected in the inlet and also found in marine sediments above the state cleanup screening level throughout much of the inlet.

In response to these findings, the following remedial action objectives (RAOs) were established in the ROD:

- Reduce the concentration of PCBs in the biologically active shallow sediments from 0 to 10 centimeter (cm) depth within OU B Marine to below the minimum cleanup level, as a measure expected to reduce PCB concentrations in fish tissue;
- Control erosion of contaminated fill material in the central shoreline area of the complex known as Site 1; and
- Selectively remove sediment with high concentrations of mercury collocated with PCBs.

To accomplish these RAOs, specific numeric target values known as minimum cleanup levels (MCULs), cleanup goals, and action levels were adopted to support the development of a sediment cleanup project for OU B Marine.

1.2.2 MCULs in OU B Marine

MCULs are compliance standards intended to protect human health and the environment. The sediment cleanup at OU B Marine was developed on the basis of an MCUL for total PCBs of 3 milligrams per kilogram of organic carbon (mg/kgOC), measured on an area-weighted average (AWA) basis for PCBs in 0 to 10-centimeter (cm) marine sediments throughout the OU B Marine area.[1] The MCUL for PCBs was developed based on interagency agreement after consideration of natural recovery modeling that predicted this MCUL could be achieved within 10 years of remedy completion assuming a post-remedy AWA of 4.1 mg/kgOC. The assumptions used in the natural recovery modeling and the modeling results are documented in a June 13, 2000 technical memorandum included in Appendix C of the original OU B Marine Monitoring Plan (U.S. Navy 2003). Although actions were taken to address mercury in sediments, the ROD did not specify an MCUL for mercury.[2]

1.2.3 Action Levels

Several action levels were identified as guidelines for use during the configuration and comparison of remedial alternatives that led to the development of the remedy for OU B Marine. Primary considerations in choosing action levels were: whether a cleanup based on these levels is likely to achieve the desired sediment quality goals, whether the levels are consistent with other regional cleanups, and whether the levels are cost-effective, appropriately balancing risk reduction against cost. A PCB action level of 12 mg/kgOC was identified for sediment dredging. An additional PCB action level of 6 mg/kgOC was identified for selecting sediment areas appropriate for enhanced natural recovery, the placement of a thin layer of clean sediment to accelerate natural recovery processes. For mercury, it was decided that the remedial action objective to selectively remove sediment containing elevated mercury co-located with elevated PCBs could be accomplished with a combined action level of 3 mg/kg mercury and 6 mg/kgOC PCBs.

[1]The sediment concentration of many organic chemicals, including PCBs, is often expressed in terms of the organic carbon content of the sediments. This "carbon-normalized" approach is believed to better represent the actual biological significance of contaminant levels. PCB concentrations in sediment, as well as regulatory criteria for sediment PCBs, are commonly stated in units of milligrams [of PCBs] per kilogram of organic carbon, or "mg/kgOC." This approach is used in this document.

[2]Refer to Section 1.3 for a discussion of the rationale for mercury action and monitoring.

1.2.4 Cleanup Goals in Sinclair Inlet

The ROD established cleanup goals for total PCBs in sediment and English sole tissue based on reference area conditions. The cleanup goal for total PCBs in sediment is 1.2 mg/kgOC, measured as an AWA throughout Sinclair Inlet. The cleanup actions taken at the site were predicated on natural recovery modeling that predicted that although a sediment PCB concentration of 3 mg/kgOC could be achieved within 10 years, several decades could be required for sediments to recover to 1.2 mg/kgOC in Sinclair Inlet.

As documented in the ROD, the cleanup goal established for English sole tissue is based on the 90th percentile of PCB concentrations measured in fish from non-urban Puget Sound embayments. The total PCBs cleanup goal for English sole is 0.023 mg/kg wet weight, based on the assumption that reductions in sediment PCB concentrations will gradually lead to reductions in PCB concentrations in fish tissue.

No cleanup goals were identified in the ROD for mercury in sediment or English sole tissue.

1.3 MONITORING PROGRAM DEVELOPMENT

Based on the conclusions in the ROD, the Navy worked closely with stakeholders in developing a program of sediment and tissue monitoring (U.S. Navy 2003). The sampling program was intended to serve as a check on the continued protectiveness of the remedy for OU B Marine and track anticipated improvements in sediment and tissue quality. The original monitoring plan included comprehensive sampling of sediment throughout Sinclair Inlet. As shown in more detail in Section 3, this sampling is guided by two sampling grids, one composed of 500-ft square cells and covering OU B Marine and the other composed of 1,500-ft square cells covering the remainder of the inlet.

In each round of sampling, a sample is made up for each cell as a composite of three separate surface grab samples, with the cell results combined on an area-weighted average basis for comparison with the cleanup goals. Composite sampling and area-weighted averaging were purposely adopted for consistency with the underlying rationale for the cleanup. The basis for the cleanup was human health risks associated with the consumption of seafood, represented by the species English sole. Based on the mobility of English sole, tissue PCB levels are believed to represent an integration of contaminants in prey species spread over considerable areas of the inlet. For this reason, the sampling program was specifically designed to emphasize overall measures of sediment quality and limit the impacts of hot spots of contamination.

The early rounds of monitoring demonstrated that despite the measures adopted to limit the impact of hot spots, occasional PCB results far higher than was typical of the overall data set were reported. These high PCB values have the effect of increasing the uncertainty regarding the representativeness of the sample data and impairing the data analyses. In response to these findings, the Navy conducted extensive studies of data variability during the 2003 and 2005 sampling rounds (U.S. Navy 2006a, U.S. Navy 2006b). These studies confirmed that the sediment matrix is highly heterogeneous and that occasional anomalously high PCB values typically are not reproduced when analyses are repeated on the original sample material. As discussed further in Section 3, a number of refinements have been made to the original sampling and data interpretation approach in response to the findings from the first sampling rounds. For example, beginning in 2007 a larger quantity of sediment was collected for each grid cell and more vigorous mixing using mechanical equipment was implemented, both in the field and at the laboratory.

Geometric means (geomeans) were also adopted for calculating AWAs for PCBs in sediment as a further measure to address variability in the results and for testing compliance with the MCUL for OU B Marine and evaluating against the cleanup goal for Sinclair Inlet.

Although no compliance standards or cleanup goals for mercury are specified in the ROD, mercury has been included in the monitoring program since its inception. Arithmetic means are used to calculate AWAs for use in comparing data across sampling events. The Navy and stakeholders are currently conducting an evaluation of mercury contamination in Sinclair Inlet that will include a focused feasibility study to select appropriate measures to address mercury. The long-term monitoring data for mercury are being used in conjunction with information from other sources to support these efforts.

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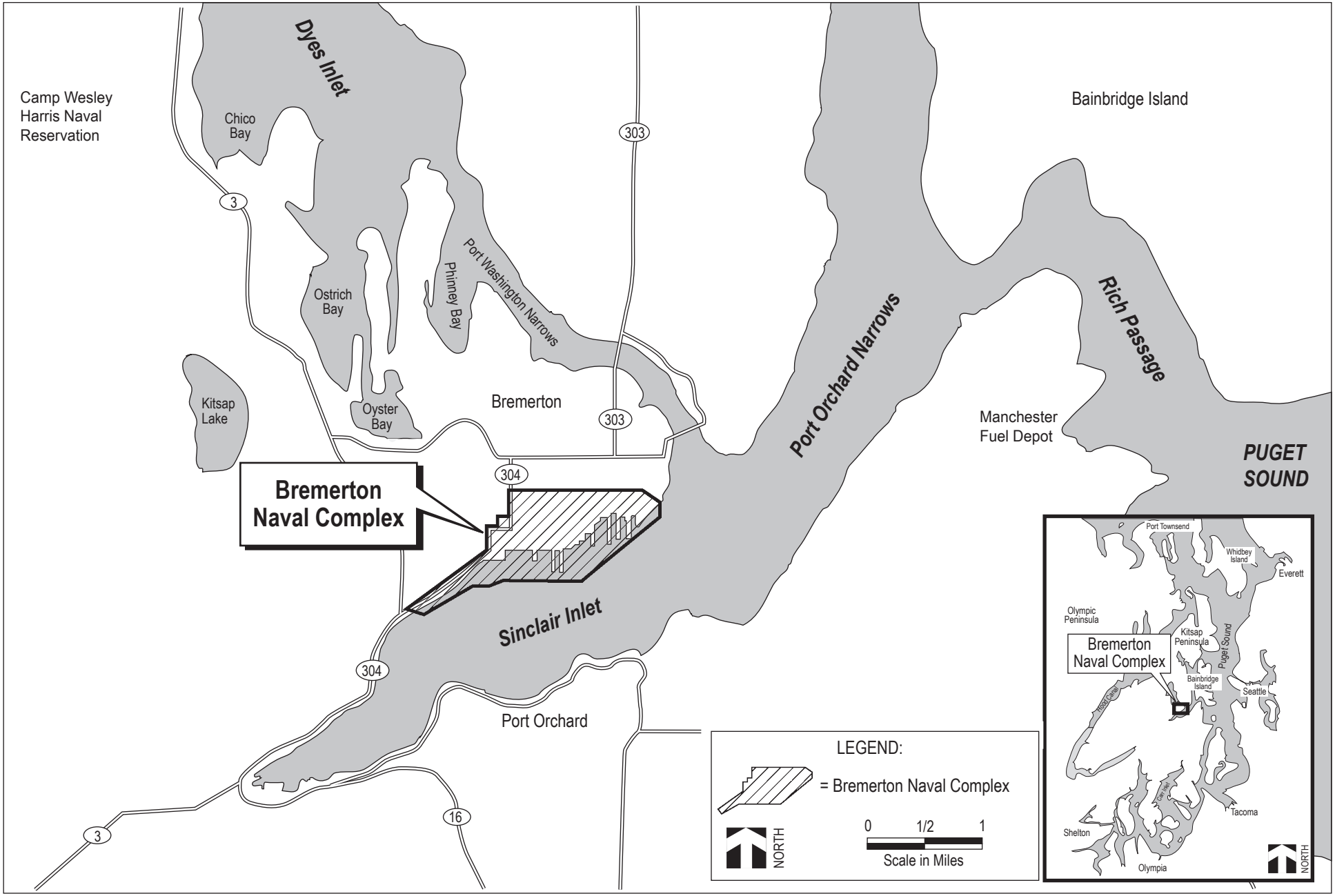
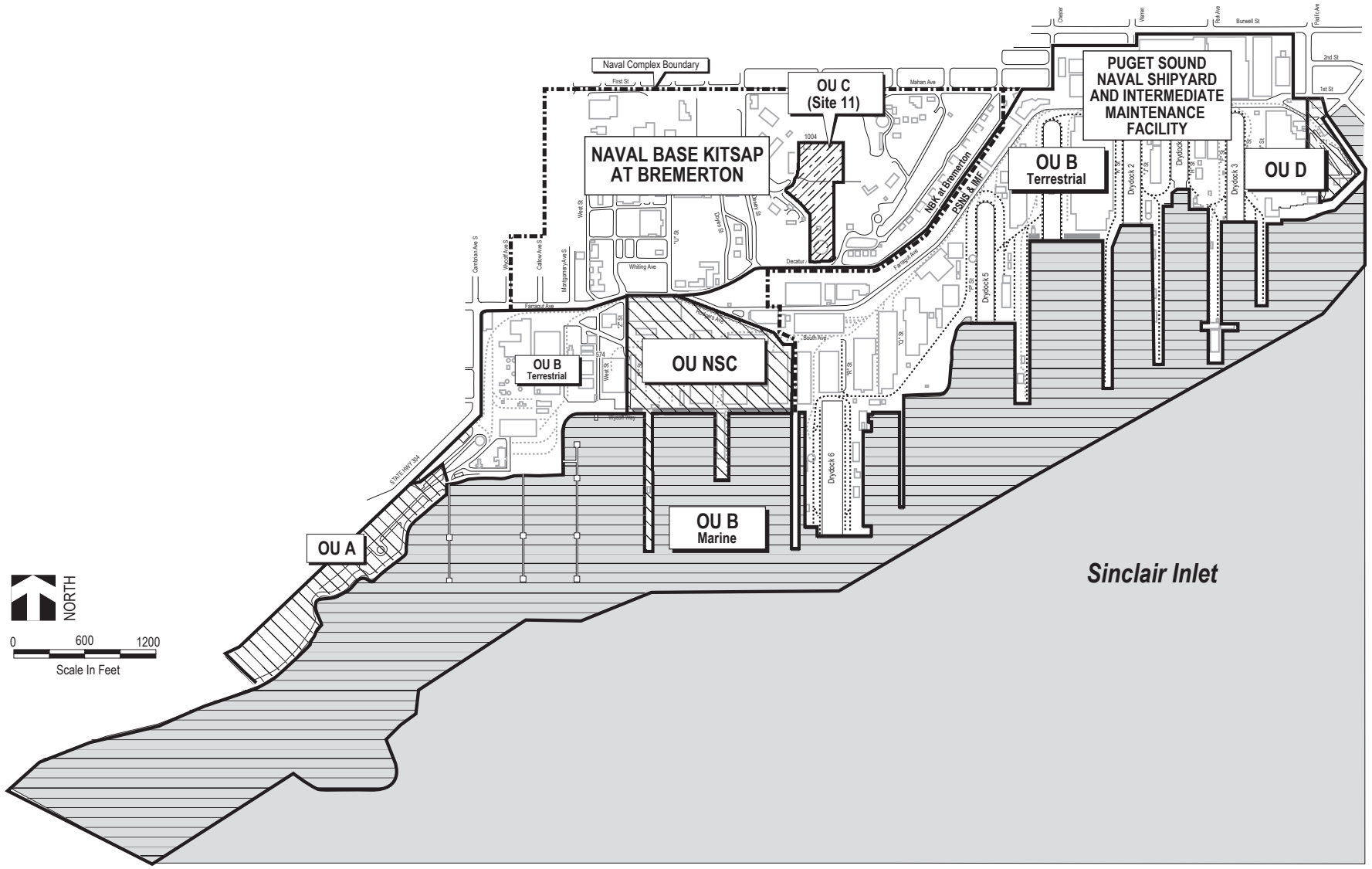


U.S.NAVY	Delivery Order 0087 Bremerton Naval Complex 2014 MARINE MONITORING REPORT FOR OU B MARINE	**Figure 1-1** **Bremerton Naval Complex Vicinity Map**



U.S.NAVY	Delivery Order 0087 Bremerton Naval Complex 2014 MARINE MONITORING REPORT FOR OU B MARINE	**Figure 1-2** **Operable Units at Bremerton Naval Complex**

2.0 DESCRIPTION OF REMEDIAL ACTION

The remedial action selected for OU B Marine was described in detail in the ROD (U.S. Navy, Ecology, and USEPA 2000). The remedial action was initiated in June 2000 and the primary remedy elements were completed by the fall of 2001. The results of the remediation were documented in a Post Construction and Closure Report published in November 2002 (U.S. Navy 2002). The primary components of the remedial action were:

- Dredging of contaminated sediments;
- Disposal of contaminated sediments in a pit excavated in the sea floor in Sinclair Inlet;
- Capping of contaminated sediments in a small area adjacent to OU A at the southwest end of the naval complex and placement of a thin layer of clean sediment to promote recovery of sediments ("enhanced natural recovery" or ENR) in the area around the cap;
- Stabilization of a section of shoreline in the center of the naval complex; and
- Ongoing processes of sediment natural recovery.

Figure 2-1 depicts the location of the primary remedy components. The individual components are described in more detail in the following paragraphs.

2.1 SEDIMENT DREDGING

Areas to be dredged within OU B Marine were selected based on the results of an intensive sediment sampling program carried out during December 1998 and January 1999. A total of approximately 32 acres of seafloor within OU B Marine found to have the highest PCB levels was designated for dredging, mostly in areas along the shoreline or adjacent to the moorings and piers of the naval complex. A limited amount of additional shallow sediment was dredged as part of the remedial action based on a combination of elevated levels of mercury as well as moderately-elevated levels of PCBs.

Analysis of sediment cores collected during the 1998-99 sampling program indicated that contamination tended to be confined to the uppermost two-foot layer of sediments, leading to the design of remedial dredge prisms with a minimum dredge depth of two feet. Material dredged from these areas is referred to as "CERCLA sediments."

The remedial action was carried out separate from, but closely coordinated with, navigation dredging in support of Navy homeport facilities. Sediments dredged for navigation purposes consisted of both sediment that was suitable for open-water disposal (as determined by the characterization and permitting requirements of the Puget Sound Dredged Disposal Analysis [PSDDA] program) as well as sediment unsuitable for open-water disposal. Unsuitable navigation sediments were disposed in a constructed on-site seafloor facility together with the CERCLA sediments from remedial dredging, as described below.

2.2 SEDIMENT DISPOSAL

As the first step in the remedial action, a facility to be used for disposal of contaminated CERCLA sediments and unsuitable navigation sediments was excavated in the seafloor on Navy property. This confined aquatic disposal pit, or CAD pit, was constructed in the shape of a 615-by-600 foot rectangle, with a depth of 30 feet and side slopes of 3 horizontal to 1 vertical. Most of the sediments excavated in constructing the CAD pit were transported to the established PSDDA open-water disposal site in Elliott Bay. However, almost one-fourth of the nearly 400,000 cubic yards removed in constructing the pit was used as cap and enhanced natural recovery (ENR) material in the OU A area or stockpiled for later use in completing the cap over the sediments disposed in the CAD pit.

Sediments dredged at OU B Marine as part of the remedial action were transported by bottom-dump barge and deposited in the CAD pit. A total of approximately 225,000 cubic yards of CERCLA sediment was dredged and placed in the CAD pit. In addition, approximately 175,000 cubic yards of unsuitable navigation sediment was placed in the CAD pit.

After being filled with contaminated sediment, the CAD pit was left undisturbed to allow for consolidation. After four months, when tests indicated that the sediments had consolidated enough to allow capping, a one-foot layer of clean sand was distributed across the CAD pit to form the initial cap layer (primary sand cap). After more than two months of additional consolidation, the cap over the CAD pit was completed. The final cap layer was made up of sediment from the turning basins in central Sinclair Inlet that had been demonstrated to meet requirements for open water disposal, together with clean sediment stockpiled from the CAD pit excavation. Based on measured volumes of sediment, the final sediment cap layer had an average unconsolidated thickness of more than six feet.

Analysis of surface sediments after the CAD pit had been capped revealed levels of contamination in the area around the CAD pit higher than expected based on the pre-cleanup data from this general area. Subsequent sediment profile imaging performed in the area surrounding the CAD pit showed a pattern of new sediment deposited on top of existing undisturbed sediment. The new material was generally thickest closest to the edge of the pit,

consistent with the idea that the new sediments represented dispersal of a limited portion of the sediments being disposed in the pit. The Navy elected, while the remedial contractor was still on site, to use stockpiled clean sediments to form a supplementary cover with an average thickness of 2 feet in an approximately 100-foot wide strip surrounding the three sides of the pit that are owned by the Navy.

The area abutting the fourth side of the CAD pit, being State-owned aquatic land (SOAL), was not addressed during the original remedial action because there was insufficient time while equipment was on site to obtain the required authorization. Instead, after discussion with the State, the Navy undertook a supplementary program to characterize the SOAL adjacent to the CAD pit as a basis for evaluating the need for further remediation in this area. This sediment characterization was performed in September 2003.

Based on the findings of this field work, the Navy, EPA, and Ecology prepared an Explanation of Significant Differences (ESD) in early 2004, documenting a change in the OU B Marine boundary to incorporate the SOAL area and identify action levels for a response action for the area (U.S. Navy 2004a). The action level documented in the ESD was a PCB level of 9.0 mg/kgOC or greater in the biologically active 0 to 10 cm zone. Subsequent to publication of the ESD, in early 2004, after consultation with the State and EPA, the Navy placed clean sediments from previously-characterized turning basin areas in central Sinclair Inlet with a thickness of 0.8 to 1.5 feet on the portion of the SOAL area that met or exceeded the action level (U.S. Navy 2004b). The Remedial Action was considered “construction complete” in March 2004.

This final step in the remedial action for OU B Marine, the placement of clean sediment material on SOAL adjacent to the CAD pit, took place after the 2003 sampling round, and thus the effects of this placement were not reflected in the 2003 monitoring report. The results of all subsequent sampling rounds do include the effects of the sediments placed on SOAL adjacent to the CAD pit.

2.3 SEDIMENT CAPPING AND ENHANCED NATURAL RECOVERY

In an area of southwest OU B Marine offshore of OU A, not subject to naval vessel traffic and where navigable water depth is thus not critical, sediments found to be contaminated were capped in place instead of being dredged (see Figure 2-1). Where contaminant levels were highest, a full cap with a thickness in excess of four feet was installed. Sediments with lower levels of contaminants were covered with a thinner layer to facilitate natural recovery processes, an approach known as enhanced natural recovery (ENR). ENR is expected to lead to gradual mixing of the new cleaner cover material with existing sediments, effectively reducing potential exposure of marine life to the contaminants. Both the cap and ENR cover were made up of clean sediments from the excavation of the CAD pit.

To limit the potential for erosion and re-exposure of contaminated sediments, a protective layer of gravel was placed over the shallow intertidal portion of the cap/ENR area. This protective layer was composed of a lower layer of fish rock habitat mix (50/50 mix of quarry spalls and 5/8 inch-minus gravel) and an upper layer of WDFW fish mix (one inch rounded gravel). Each layer was approximately one foot thick.

2.4 SHORELINE STABILIZATION

Slope stabilization measures were implemented at one location known as Site 1 in the center of the naval complex, where historical bank slumping had been observed (see Figure 2-1). The primary stabilization measures at Site 1 included installing sheetpile at the base of the slope and placement of riprap along the bank at a more stable angle than had previously existed.

2.5 NATURAL RECOVERY

The final component of the remedy for OU B Marine is sediment natural recovery. Natural recovery involves the ongoing deposition and mixing of cleaner sediment with existing sediments, leading to gradual reduction in contaminant concentrations. The 10-year timeline for this recovery, based on the date when active remedy steps were completed, ended on March 15, 2014.

2.6 MONITORING

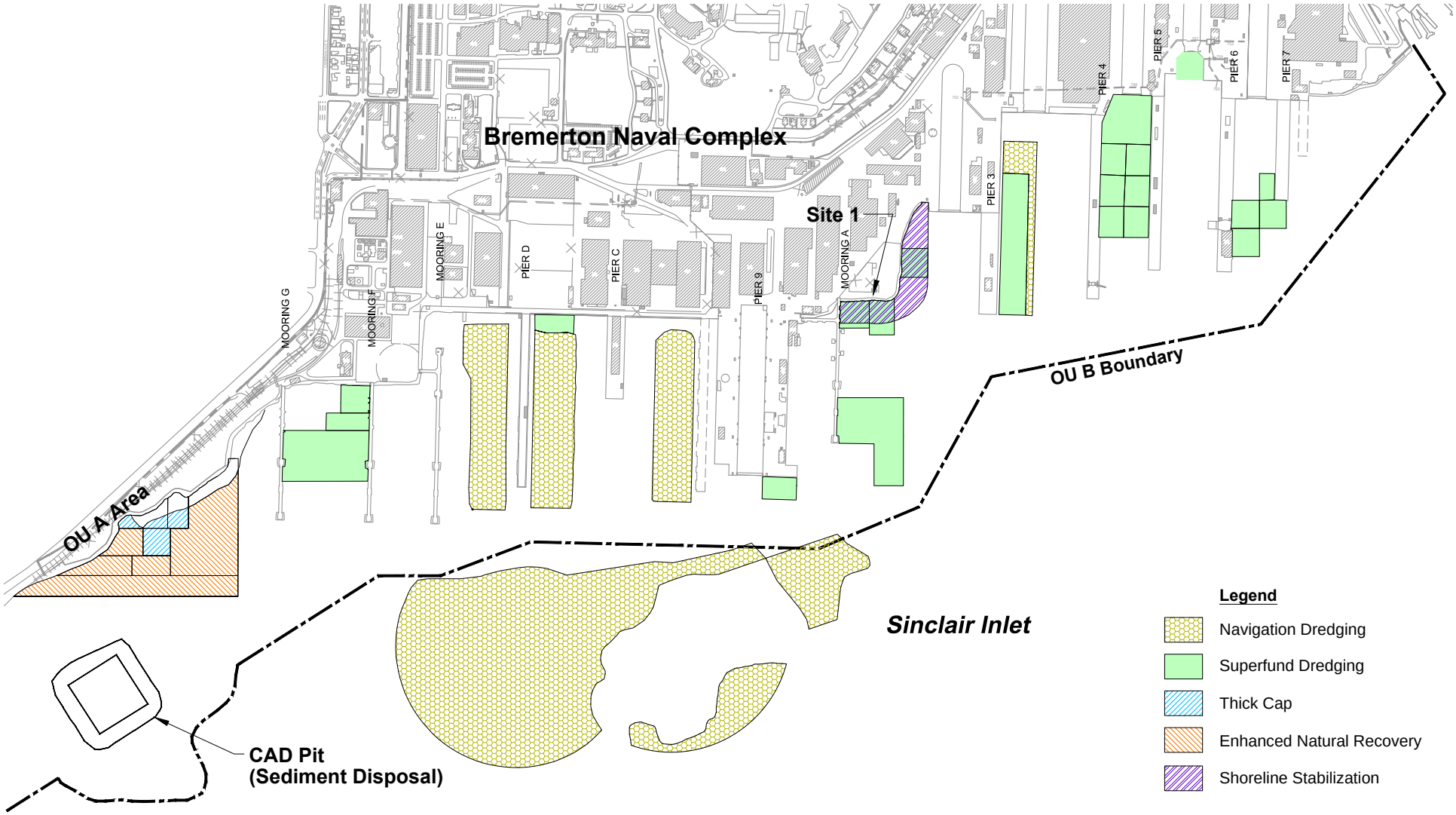
As part of the selected remedy, the ROD requires that marine monitoring be conducted to document progress toward and attainment of the cleanup goals and objectives, and to verify the integrity of the remedy.

The objectives of the monitoring program are briefly summarized below:

- To verify attainment of the cleanup objectives
- To confirm the physical integrity of the CAD pit and shoreline stabilization measures
- To confirm predicted natural recovery of sediments in OU B Marine
- To evaluate the success of the remediation in reducing chemical of concern (COC) concentrations in tissue as represented by English sole

The objectives of the Charleston Beach sediment sampling were to provide information to support ongoing beach stabilization design work and to assess whether landfill materials are impacting the adjacent marine sediments.

The results of the first five rounds of post-RA long-term monitoring have been presented in separate monitoring reports (U.S. Navy 2006a, U.S. Navy 2006b, U.S. Navy 2009, U.S. Navy 2012a, and U.S. Navy 2015). The results of the first completed components of the sixth round of post-RA monitoring (hereafter referred to as Round 6 monitoring or 2014 monitoring) were presented in the 2014 OU B Marine Phase 1 Long-term Monitoring Report (U.S. Navy 2016). The results of the final two components of the 2014 monitoring are documented in Section 3. The associated sampling data are presented in Appendix A.



U.S. NAVY

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SCALE IN FEET

Figure 2-1
Remedial Action at OU B Marine
(2000-2001)

Delivery Order 0087
Bremerton Naval Complex
2014 MARINE MONITORING
REPORT FOR OU B MARINE

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3.0 DESCRIPTION OF MARINE MONITORING ACTIVITIES

To achieve the monitoring goals defined in the ROD for OU B Marine (U.S. Navy, Ecology, and USEPA 2000), the Navy, working closely with regulatory agency representatives, identified a set of specific marine monitoring activities. These monitoring activities are described in detail in the 2014 OU B Marine Monitoring Plan (U.S. Navy 2014) and consist of:

- Sub-bottom profiling of the CAD Pit
- Surface sediment sampling of OU B Marine and Sinclair Inlet outside OU B Marine
- Intertidal and subtidal sediment sampling at Charleston Beach
- English sole sampling

The first two tasks were performed in 2014, and the results were presented in an earlier report (U.S. Navy 2016). This report presents the results of the intertidal and subtidal sediment sampling at Charleston Beach and the English sole sampling.

This section is organized as follows. Subsection 3.1 is a Data Usability Assessment. Subsection 3.2 describes some special considerations relating to the marine monitoring data. Subsection 3.3 summarizes the results of the analysis of the Charleston Beach sediment samples and the English sole tissue samples collected from central Sinclair Inlet.

3.1 DATA USABILITY ASSESSMENT

The independent data validator and the URS project chemist assessed the Phase 2 analytical data for precision, accuracy, completeness, representativeness, and comparability. Precision and accuracy were evaluated based on field and laboratory analytical quality control parameters. Out of a total of 74 individual Aroclor and metals detections 17, or 23 percent, were qualified as estimated. As detailed in the data quality assessment included in Appendix B, in general all data are acceptable for use, and no serious quality control criteria exceedances were observed. All planned sediment samples were collected. However, the PSEMP fish trawls carried out in Sinclair Inlet yielded only a total of 117 individual English sole rather than the 200 that were planned. The goal was to prepare a total of ten 20-fish composite samples. Instead three 20-fish and three 19-fish composites were prepared. All analytical data are acceptable for use as qualified (i.e., no data were rejected during validation), so the completeness of the sediment samples is 100 percent but completeness for the English sole samples is only about 60

percent based on the number of samples collected. Representativeness of the data is determined to be acceptable and compliant with the sampling design. The comparability of laboratory data was assessed by the use of laboratories that hold DoD Environmental Laboratory Approval Program certifications, which require standardization of laboratory quality assurance and quality control programs. Comparability of the Phase 2 data was determined to be acceptable, as the sediment samples were intended to be used only for a one-time characterization of intertidal and subtidal conditions rather than for comparison to other LTM data and the shortfall in English sole samples is acceptable because these data are not required to support any critical decision-making.

3.2 SPECIAL CONSIDERATIONS IN WORKING WITH MARINE MONITORING DATA

As the monitoring program has progressed, a number of refinements, mostly related to sample preparation and data interpretation, have been implemented.

3.2.1 Preparation of Marine Sediment Samples

Analysis of the sediment PCB results during the first rounds of the OU B Marine long-term monitoring revealed greater variability than expected based on the pre-remedy PCB findings. Multiple follow-up analyses for PCBs using leftover LTM sediments, undertaken during focused studies of data variability, demonstrated that, in general, higher PCB values did not reoccur. This suggested that the original high reported values were not truly representative of actual overall sediment conditions. The long-term monitoring is understood to be attempting to monitor relatively small changes in overall PCB values over time, and occasional high values have the potential to mask long-term trends.

Based on these findings, several measures were adopted beginning in 2007 to attempt to improve sample representativeness and limit the potential for anomalous samples to interfere with the detection of sediment PCB trends. In the field a larger quantity of sediment was used in preparing the samples and mechanical mixing was adopted in order to achieve a greater homogeneity in the sample material. The laboratory was also directed to mechanically mix the sample material prior to analysis.

The Charleston Beach sediment samples discussed in this report were collected as part of a one-time characterization of sediments not included in the LTM sampling rather than for trend analysis. The manual collection methods used to collect the intertidal samples tend to be more labor-intensive and constrained by the short period when the lowest part of the beach is exposed by low tide. For these reasons the sediment processing innovations mentioned above were not used with these sediment samples.

This topic is discussed in more detail in the 2014 Phase 1 report (U.S. Navy 2016).

3.2.2 Working with Dual-Column PCB Readings

The analytical method used for PCB analyses for both the pre-RA (1998-1999) and post-RA monitoring, EPA Method 8082, utilizes a dual-column gas chromatograph. Detailed review of the pre-RA data packages showed that in most cases the laboratory reported the lower of the two column readings. For consistency, the Navy with agency concurrence has directed the laboratory throughout the LTM program to report the lower column reading unless professional judgement suggests otherwise.

3.2.3 Calculating Total PCBs

The total PCB values discussed and statistically analyzed in this report represent the sum of the reported individual Aroclor detected concentrations for all samples where one or more Aroclors were detected. For samples in which Aroclors were detected, non-detections are ignored. For samples with no detected Aroclors, the total PCB concentration was defined as the highest reported detection limit in the sample for any of the individual Aroclors commonly detected at the site, namely Aroclors 1242, 1254, 1260, and 1268 (U.S. Navy 2012b).

3.2.4 Organic Carbon Normalizing of Sediment PCB Concentrations

As noted in Section 1, PCB concentrations in marine sediments are commonly converted to an organic-carbon-normalized basis with units of milligrams of PCB per kilogram of organic carbon (mg/kgOC). The normalized value is computed by dividing the bulk PCB concentration in a sample by the percentage of organic carbon measured in the same sample. This method of calculating total PCBs is consistent with the Washington State Sediment Management Standards (Ecology 2013) and widely used in sediment remediation work in the Pacific Northwest. In practice, carbon normalization is not performed when the TOC values are below 0.5 percent or above 3.5 percent.

3.2.5 Field Duplicates

A field duplicate was collected for one of the sediment samples. No English sole duplicate was prepared. The sample pair results are presented in Appendix B. No formal data quality objectives were established for the field duplicates in this project. However, in one other recent sediment collection performed in Sinclair Inlet by the Navy, a DQO was established that called for the relative percent difference (RPD) for mercury in sediment to be less than or equal to 100 percent, and that value will be used as an informal benchmark for this project. The field duplicate summary table in Appendix B shows that none of the RPD values for bulk PCBs, mercury, and seven other metals exceed 100 percent. The highest RPD is 32 percent.

3.3 MEASURES TO ASSESS PROGRESS TOWARDS CLEANUP GOALS

As described in the 2014 OU B Marine Long-term Monitoring Plan (U.S. Navy 2014), monitoring program activities intended to measure progress towards cleanup goals were:

- Surface sediment sampling within OU B Marine
- Surface sediment sampling in Sinclair Inlet outside OU B Marine
- Beach sediment sampling at Charleston Beach
- English sole tissue sampling in Sinclair Inlet

The first two tasks were performed in September 2014 and were presented in an earlier report (U.S. Navy 2016). At Charleston Beach, a single subtidal sediment sample was collected in September 2014 and five intertidal sediment samples were collected in May 2015. The Puget Sound Ecosystem Monitoring Program (PSEMP) performed English sole sampling in May 2015 and provided samples from this collection to the Navy. The results of the Charleston Beach sediment sampling and English sole sampling are discussed below. The Charleston Beach sediment and English sole tissue data are presented in Appendix A. Supporting materials are presented in Appendix B.

3.3.1 Sampling of Subtidal and Intertidal Sediments at Charleston Beach

Description of Monitoring Activity

A total of six 0 to 10 centimeter sediment grab samples were collected at Charleston Beach at the far southwest end of the naval complex. A single subtidal sample was collected in September 2014 using a van Veen grab sampler from the marine research vessel used to perform the primary long-term monitoring (LTM) of sediment for OU B Marine. Five intertidal samples were collected from the beach using hand methods in May 2015. The sampling locations are shown in Figure 3-1. Latitude and longitude were recorded at the time of sampling, but not elevation. It is estimated based on the time of sampling and the predicted low tide at the time that the intertidal samples were collected from between -1.0 and -2.4 feet MLLW. The presence of seeps was recorded at locations CB-4 and CB-5, but not at the other three intertidal locations. The samples were submitted to ALS Environmental (formerly Columbia Analytical Services) of Kelso, Washington for analysis for PCB Aroclors, TOC, mercury, percent moisture, and grain size. The analysis of the single subtidal sample was performed in 2014 together with the primary LTM sediment samples. The intertidal samples were analyzed in 2015.

Deviations from Work Plan

There were no deviations from the work plan.

Results of Monitoring Activity

The detailed laboratory results are presented in Appendix A. Table 3-1 presents the findings for the Charleston Beach sediment samples, as summarized below.

- **PCBs.** PCBs were not detected in any of the six samples. The TOC results were outside the range commonly used to normalize PCBs for four of the six samples, so only the bulk PCBs results are shown in Table 3-1 for these samples.

- **Mercury.** Mercury was detected in all six samples, at concentrations ranging from 0.037 to 0.18 mg/kg.

- **Other Metals.** The metals arsenic, cadmium, chromium, copper, lead, silver, and zinc were all detected in all six samples. None of the detected metals concentrations exceeded the state sediment cleanup objectives. However, sample CB-6 exceeded the natural background values shown in Table 3-1 for cadmium, copper, lead, and silver, and samples CB-1 and CB-3 also exceeded natural background for lead.

3.3.2 Sampling of English Sole

Description of Monitoring Activity

English sole were collected in 2015 from central Sinclair Inlet as part of the regular trawl collection performed as part of the Puget Sound Ecosystem Monitoring Program (PSEMP). Washington State Department of Fish and Wildlife (WDFW) staff prepared six composite samples, three samples each made up of equal-weight filets from 20 individual fish and three from 19 individual fish. These samples were transported by courier to ALS Environmental of Kelso, Washington for analysis for PCBs, mercury, and lipids.

Deviations from Work Plan

The work plan called for ten English sole samples to be prepared, each made up as a composite of filets from 20 individual fish. However, the PSEMP trawls only yielded a total of 117 English sole of the minimum required length of 22 cm. The decision was made in conjunction with the project team to use these fish to make up six composite samples.

Results of Monitoring Activity

The detailed laboratory results are presented in Appendix A. Table 3-2 presents the findings for the English sole tissue analyses, which can be summarized as follows:

- **PCBs.** PCBs were detected in all six samples, at concentrations ranging from 0.017 to 0.043 mg/kg on a wet weight basis. The average PCB concentration was 0.030 mg/kg, wet weight. For comparison, the average English sole PCB concentrations in prior similar sampling included in the 2003, 2007, 2010, and 2012 LTM rounds were 0.11, 0.033, 0.033, and 0.068 mg/kg, wet weight.

- **Mercury.** Mercury was detected in all six samples, at concentrations ranging from 0.030 to 0.046 mg/kg, wet weight. The average mercury concentration was 0.037 mg/kg, wet weight. The average English sole mercury concentrations in the 2003, 2007, 2010, and 2012 LTM rounds were 0.044, 0.025, 0.056, and 0.048 mg/kg, wet weight.

Path: J:\GIS\Projects\NAVY\PSNS\IDIQ\DO 51\GIS\Figure 3-1_Sediment Sampling Locations at Charleston Beach.mxd 5/3/2016

U.S. NAVY

Delivery Order 0087
Bremerton Naval Complex
2014/15 Phase 2
Data Report

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Feet

Figure 3-1
Sediment Sampling Locations at Charleston Beach

Table 3-1
2014-15 Charleston Beach Sediment Sampling

Sample #	Fines (Clay + Silt) (%)	TOC (%)	PCBs (µg/kg)	PCBs (mg/kgOC)	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Silver (mg/kg)	Zinc (mg/kg)
SCO/CSL	---	---	---	**12/65**	**57/93**	**5.1/6.7**	**260/270**	**390/390**	**450/530**	**0.41/0.59**	**6.1/6.1**	**410/960**
Natural Background*	---	---	---	---	11	0.8	62	45	21	0.2	0.24	93
CB-1	8.2	1.7	4.3 U	0.12 U	2.7	0.38	9.1	36	33 J	0.046	0.089	57
CB-2	3.0	0.32	4.3 U	--- **	2.4	0.20	11	25	18 J	0.060	0.060	56
CB-3	2.4	0.25	4.3 U	--- **	2.0	0.14	11	29	25 J	0.047	0.053	60
CB-4	3.0	0.27	4.3 U	--- **	2.5	0.21	13	22	7.9 J	0.037	0.067	42
CB-4 (FD)	3.2	0.25	4.3 U	--- **	2.0	0.25	9.9	22	9.6 J	0.051	0.065	37
CB-5	2.3	0.18	4.3 U	--- **	1.4	0.10	8.4	33	5.9 J	0.037	0.045	36
CB-6***	31	2.7	140 U****	5.2 U	10	1.5	33 J	160 J	260 J	0.18	0.26	280 J

Notes:
* 90/90 upper tolerance limit (UTL) values calculated from "BOLD Plus" data and presented in Ecology's Sediment Cleanup User's Manual II (Ecology 2015). A natural background value of 0.0000002 mg/kg was calculated for bulk PCBs, but this was based on congener analyses and is not directly comparable to the Aroclor values presented here.
** TOC value is outside the range generally accepted for normalizing PCBs
*** Subtidal sample collected from marine research vessel during LTM sediment sampling in September 2014. Others are intertidal samples collected from on-shore in May 2015.
**** Elevated detection limit likely caused by matrix interference. Does not impair data usability but does impact use for regulatory comparisons (see Data Quality Assessment in Appendix B).
U – undetected; J - estimated value
SCO/CSL – Washington State sediment cleanup objective/cleanup screening level (new term replaced former "SQS" in connection with publication of Sediment Cleanup User's Manual II [Ecology 2015])

Table 3-2
2015 English Sole Sampling

Sample #	Mercury (mg/kg wet)	PCBs (mg/kg wet)	Lipids (%)	Total Solids (%)
SI-ESMO1 B	0.046	0.022 J	0.40	17
SI-ESMO2 B	0.034	0.027 J	0.48	18
SI-ESMO3 B	0.030	0.043 J	0.61	17
SI-ESMO4 B	0.037	0.041	0.60	18
SI-ESMO5 B	0.038	0.017 J	0.23	17
SI-ESMO6 B	0.037	0.030 J	0.41	17

Note: J - estimated value

4.0 SUMMARY

The final components of the 2014 monitoring for OU B Marine at the Bremerton Naval Complex consisted of sampling and analysis of subtidal and intertidal sediments at Charleston Beach and collection and analysis of English sole from central Sinclair Inlet.

The results of the Charleston Beach sediment sampling can be summarized as follows:

- **PCBs.** PCBs were not detected in any of the six samples.
- **Mercury.** Mercury was detected in all six samples, at concentrations ranging from 0.037 to 0.18 mg/kg.
- **Other Metals.** The metals arsenic, cadmium, chromium, copper, lead, silver, and zinc were all detected in all six samples.

The results of the English sole sampling can be summarized as follows:

- **PCBs.** PCBs were detected in all six tissue samples, at concentrations ranging from 0.017 to 0.043 mg/kg on a wet weight basis. The average PCB concentration was 0.030 mg/kg, wet weight. For comparison, the average English sole PCB concentrations in prior similar sampling included in the 2003, 2007, 2010, and 2012 LTM rounds were 0.11, 0.033, 0.033, and 0.068 mg/kg, wet weight.
- **Mercury.** Mercury was detected in all six samples, at concentrations ranging from 0.030 to 0.046 mg/kg, wet weight. The average mercury concentration was 0.037 mg/kg, wet weight. The average English sole mercury concentrations in the 2003, 2007, 2010, and 2012 LTM rounds were 0.044, 0.025, 0.056, and 0.048 mg/kg, wet weight.

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APPENDIX A

Data Summary

Data Summary

Installation: BREMERTON_NS **Sampling Company:** URS, INC. **Task-Phase:** 0087 - **Lab:** ALS KELSO ENVIRONMENTAL LABORATORY

Matrix Type: Animal Tissue

Analytical Method: 7471B **Method Class:** Metals

Site ID	Location ID	Loc Type	Depth Range	Sample Date	Sample ID	Sample Type	Dilution Factor	Unit of Measure	Analyte Name	Analysis Value	Data Qual
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM01 B	N	2	MG_KG	MERCURY	0.0456	
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM02 B	N	2	MG_KG	MERCURY	0.034	
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM03 B	N	2	MG_KG	MERCURY	0.0301	
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM04 B	N	2	MG_KG	MERCURY	0.0367	
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM05 B	N	2	MG_KG	MERCURY	0.0384	
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM06 B	N	2	MG_KG	MERCURY	0.0371	

Data Summary

Installation: BREMERTON_NS **Sampling Company:** URS, INC. **Task-Phase:** 0087 - **Lab:** ALS KELSO ENVIRONMENTAL LABORATORY

Matrix Type: Animal Tissue

Analytical Method: 8082A **Method Class:** PCBs

Site ID	Location ID	Loc Type	Depth Range	Sample Date	Sample ID	Sample Type	Dilution Factor	Unit of Measure	Analyte Name	Analysis Value	Data Qual
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM01 B	N	1	UG_KG	AROCLOR-1016	5.8	U
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM01 B	N	1	UG_KG	AROCLOR-1221	5.8	U
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM01 B	N	1	UG_KG	AROCLOR-1232	5.8	U
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM01 B	N	1	UG_KG	AROCLOR-1242	5.8	U
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM01 B	N	1	UG_KG	AROCLOR-1248	5.8	U
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM01 B	N	1	UG_KG	AROCLOR-1254	11	J
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM01 B	N	1	UG_KG	AROCLOR-1260	11	J
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM01 B	N	1	UG_KG	AROCLOR-1268	5.8	U
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM02 B	N	1	UG_KG	AROCLOR-1016	5.8	U
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM02 B	N	1	UG_KG	AROCLOR-1221	5.8	U
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM02 B	N	1	UG_KG	AROCLOR-1232	5.8	U
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM02 B	N	1	UG_KG	AROCLOR-1242	5.8	U
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM02 B	N	1	UG_KG	AROCLOR-1248	5.8	U

Data Summary

Installation: BREMERTON_NS **Sampling Company:** URS, INC. **Task-Phase:** 0087 - **Lab:** ALS KELSO ENVIRONMENTAL LABORATORY

Matrix Type: Animal Tissue

Analytical Method: 8082A **Method Class:** PCBs

Site ID	Location ID	Loc Type	Depth Range	Sample Date	Sample ID	Sample Type	Dilution Factor	Unit of Measure	Analyte Name	Analysis Value	Data Qual
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM02 B	N	1	UG_KG	AROCLOR-1254	13	J
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM02 B	N	1	UG_KG	AROCLOR-1260	14	
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM02 B	N	1	UG_KG	AROCLOR-1268	5.8	U
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM03 B	N	1	UG_KG	AROCLOR-1016	5.8	U
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM03 B	N	1	UG_KG	AROCLOR-1221	5.8	U
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM03 B	N	1	UG_KG	AROCLOR-1232	5.8	U
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM03 B	N	1	UG_KG	AROCLOR-1242	5.8	U
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM03 B	N	1	UG_KG	AROCLOR-1248	5.8	U
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM03 B	N	1	UG_KG	AROCLOR-1254	21	
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM03 B	N	1	UG_KG	AROCLOR-1260	22	J
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM03 B	N	1	UG_KG	AROCLOR-1268	5.8	U
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM04 B	N	1	UG_KG	AROCLOR-1016	5.8	U
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM04 B	N	1	UG_KG	AROCLOR-1221	5.8	U

Data Summary

Installation: BREMERTON_NS **Sampling Company:** URS, INC. **Task-Phase:** 0087 - **Lab:** ALS KELSO ENVIRONMENTAL LABORATORY

Matrix Type: Animal Tissue

Analytical Method: 8082A **Method Class:** PCBs

Site ID	Location ID	Loc Type	Depth Range	Sample Date	Sample ID	Sample Type	Dilution Factor	Unit of Measure	Analyte Name	Analysis Value	Data Qual
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM04 B	N	1	UG_KG	AROCLOR-1232	5.8	U
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM04 B	N	1	UG_KG	AROCLOR-1242	5.8	U
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM04 B	N	1	UG_KG	AROCLOR-1248	5.8	U
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM04 B	N	1	UG_KG	AROCLOR-1254	20	
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM04 B	N	1	UG_KG	AROCLOR-1260	21	
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM04 B	N	1	UG_KG	AROCLOR-1268	5.8	U
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM05 B	N	1	UG_KG	AROCLOR-1016	5.8	UJ
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM05 B	N	1	UG_KG	AROCLOR-1221	5.8	UJ
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM05 B	N	1	UG_KG	AROCLOR-1232	5.8	UJ
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM05 B	N	1	UG_KG	AROCLOR-1242	5.8	UJ
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM05 B	N	1	UG_KG	AROCLOR-1248	5.8	UJ
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM05 B	N	1	UG_KG	AROCLOR-1254	7.9	J
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM05 B	N	1	UG_KG	AROCLOR-1260	8.8	J

Data Summary

Installation: BREMERTON_NS **Sampling Company:** URS, INC. **Task-Phase:** 0087 - **Lab:** ALS KELSO ENVIRONMENTAL LABORATORY

Matrix Type: Animal Tissue

Analytical Method: 8082A **Method Class:** PCBs

Site ID	Location ID	Loc Type	Depth Range	Sample Date	Sample ID	Sample Type	Dilution Factor	Unit of Measure	Analyte Name	Analysis Value	Data Qual
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM05 B	N	1	UG_KG	AROCLOR-1268	5.8	UJ
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM06 B	N	1	UG_KG	AROCLOR-1016	5.8	U
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM06 B	N	1	UG_KG	AROCLOR-1221	5.8	U
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM06 B	N	1	UG_KG	AROCLOR-1232	5.8	U
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM06 B	N	1	UG_KG	AROCLOR-1242	5.8	U
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM06 B	N	1	UG_KG	AROCLOR-1248	5.8	U
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM06 B	N	1	UG_KG	AROCLOR-1254	14	J
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM06 B	N	1	UG_KG	AROCLOR-1260	16	
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM06 B	N	1	UG_KG	AROCLOR-1268	5.8	U

Data Summary

Installation: BREMERTON_NS **Sampling Company:** URS, INC. **Task-Phase:** 0087 - **Lab:** ALS KELSO ENVIRONMENTAL LABORATORY

Matrix Type: Animal Tissue

Analytical Method: FREEZE_DRY **Method Class:** Physical Characteristics

Site ID	Location ID	Loc Type	Depth Range	Sample Date	Sample ID	Sample Type	Dilution Factor	Unit of Measure	Analyte Name	Analysis Value	Data Qual
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM01 B	N	1	PCT	TOTAL SOLIDS	17	
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM01 B	N	1	PCT	LIPIDS	0.4	
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM02 B	N	1	PCT	TOTAL SOLIDS	17.7	
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM02 B	N	1	PCT	LIPIDS	0.48	
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM03 B	N	1	PCT	TOTAL SOLIDS	16.9	
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM03 B	N	1	PCT	LIPIDS	0.61	
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM04 B	N	1	PCT	TOTAL SOLIDS	17.8	
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM04 B	N	1	PCT	LIPIDS	0.6	
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM05 B	N	1	PCT	TOTAL SOLIDS	16.9	
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM05 B	N	1	PCT	LIPIDS	0.23	
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM06 B	N	1	PCT	TOTAL SOLIDS	17.2	
OPERABLE UNIT B (MARINE) - OUTER BOUNDARY	USFWS-PSAMP	Subtidal	NA	20150507	SI-ESM06 B	N	1	PCT	LIPIDS	0.41	

Data Summary

Installation: BREMERTON_NS **Sampling Company:** URS, INC. **Task-Phase:** 0087 - **Lab:** ALS KELSO ENVIRONMENTAL LABORATORY

Matrix Type: Marine Sediment

Analytical Method: 6020 **Method Class:** Metals

Site ID	Location ID	Loc Type	Depth Range	Sample Date	Sample ID	Sample Type	Dilution Factor	Unit of Measure	Analyte Name	Analysis Value	Data Qual
OPERABLE UNIT B - MARINE	CB6	Subtidal	0-10 cm	20140929	CB6-20140929	N	5	MG_KG	ARSENIC	10.5	
OPERABLE UNIT B - MARINE	CB6	Subtidal	0-10 cm	20140929	CB6-20140929	N	5	MG_KG	CADMIUM	1.47	
OPERABLE UNIT B - MARINE	CB6	Subtidal	0-10 cm	20140929	CB6-20140929	N	5	MG_KG	CHROMIUM, TOTAL	32.7	J
OPERABLE UNIT B - MARINE	CB6	Subtidal	0-10 cm	20140929	CB6-20140929	N	5	MG_KG	COPPER	163	J
OPERABLE UNIT B - MARINE	CB6	Subtidal	0-10 cm	20140929	CB6-20140929	N	5	MG_KG	LEAD	260	J
OPERABLE UNIT B - MARINE	CB6	Subtidal	0-10 cm	20140929	CB6-20140929	N	1	MG_KG	MERCURY	0.183	
OPERABLE UNIT B - MARINE	CB6	Subtidal	0-10 cm	20140929	CB6-20140929	N	5	MG_KG	SILVER	0.258	
OPERABLE UNIT B - MARINE	CB6	Subtidal	0-10 cm	20140929	CB6-20140929	N	5	MG_KG	ZINC	276	J
OPERABLE UNIT B - MARINE	OUBMCB1	Intertidal	0-10 cm	20150518	OUBMCB1	N	5.0	MG_KG	ARSENIC	2.67	
OPERABLE UNIT B - MARINE	OUBMCB1	Intertidal	0-10 cm	20150518	OUBMCB1	N	5.0	MG_KG	CADMIUM	0.385	
OPERABLE UNIT B - MARINE	OUBMCB1	Intertidal	0-10 cm	20150518	OUBMCB1	N	5.0	MG_KG	CHROMIUM, TOTAL	9.07	
OPERABLE UNIT B - MARINE	OUBMCB1	Intertidal	0-10 cm	20150518	OUBMCB1	N	5.0	MG_KG	COPPER	35.8	
OPERABLE UNIT B - MARINE	OUBMCB1	Intertidal	0-10 cm	20150518	OUBMCB1	N	5.0	MG_KG	LEAD	32.9	J
OPERABLE UNIT B - MARINE	OUBMCB1	Intertidal	0-10 cm	20150518	OUBMCB1	N	1.0	MG_KG	MERCURY	0.046	
OPERABLE UNIT B - MARINE	OUBMCB1	Intertidal	0-10 cm	20150518	OUBMCB1	N	5.0	MG_KG	SILVER	0.089	
OPERABLE UNIT B - MARINE	OUBMCB1	Intertidal	0-10 cm	20150518	OUBMCB1	N	5.0	MG_KG	ZINC	56.9	
OPERABLE UNIT B - MARINE	OUBMCB2	Intertidal	0-10 cm	20150518	OUBMCB2	N	5.0	MG_KG	ARSENIC	2.37	
OPERABLE UNIT B - MARINE	OUBMCB2	Intertidal	0-10 cm	20150518	OUBMCB2	N	5.0	MG_KG	CADMIUM	0.203	
OPERABLE UNIT B - MARINE	OUBMCB2	Intertidal	0-10 cm	20150518	OUBMCB2	N	5.0	MG_KG	CHROMIUM, TOTAL	10.7	
OPERABLE UNIT B - MARINE	OUBMCB2	Intertidal	0-10 cm	20150518	OUBMCB2	N	5.0	MG_KG	COPPER	25.3	
OPERABLE UNIT B - MARINE	OUBMCB2	Intertidal	0-10 cm	20150518	OUBMCB2	N	5.0	MG_KG	LEAD	18.4	J
OPERABLE UNIT B - MARINE	OUBMCB2	Intertidal	0-10 cm	20150518	OUBMCB2	N	1.0	MG_KG	MERCURY	0.060	
OPERABLE UNIT B - MARINE	OUBMCB2	Intertidal	0-10 cm	20150518	OUBMCB2	N	5.0	MG_KG	SILVER	0.060	
OPERABLE UNIT B - MARINE	OUBMCB2	Intertidal	0-10 cm	20150518	OUBMCB2	N	5.0	MG_KG	ZINC	56.0	
OPERABLE UNIT B - MARINE	OUBMCB3	Intertidal	0-10 cm	20150518	OUBMCB3	N	5.0	MG_KG	ARSENIC	1.96	
OPERABLE UNIT B - MARINE	OUBMCB3	Intertidal	0-10 cm	20150518	OUBMCB3	N	5.0	MG_KG	CADMIUM	0.137	

Data Summary

Installation: BREMERTON_NS **Sampling Company:** URS, INC. **Task-Phase:** 0087 - **Lab:** ALS KELSO ENVIRONMENTAL LABORATORY

Matrix Type: Marine Sediment

Analytical Method: 6020 **Method Class:** Metals

Site ID	Location ID	Loc Type	Depth Range	Sample Date	Sample ID	Sample Type	Dilution Factor	Unit of Measure	Analyte Name	Analysis Value	Data Qual
OPERABLE UNIT B - MARINE	OUBMCB3	Intertidal	0-10 cm	20150518	OUBMCB3	N	5.0	MG_KG	CHROMIUM, TOTAL	11.1	
OPERABLE UNIT B - MARINE	OUBMCB3	Intertidal	0-10 cm	20150518	OUBMCB3	N	5.0	MG_KG	COPPER	29.3	
OPERABLE UNIT B - MARINE	OUBMCB3	Intertidal	0-10 cm	20150518	OUBMCB3	N	5.0	MG_KG	LEAD	25.2	J
OPERABLE UNIT B - MARINE	OUBMCB3	Intertidal	0-10 cm	20150518	OUBMCB3	N	1.0	MG_KG	MERCURY	0.047	
OPERABLE UNIT B - MARINE	OUBMCB3	Intertidal	0-10 cm	20150518	OUBMCB3	N	5.0	MG_KG	SILVER	0.053	
OPERABLE UNIT B - MARINE	OUBMCB3	Intertidal	0-10 cm	20150518	OUBMCB3	N	5.0	MG_KG	ZINC	60.0	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCB4	N	5.0	MG_KG	ARSENIC	2.46	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCB4	N	5.0	MG_KG	CADMIUM	0.207	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCB4	N	5.0	MG_KG	CHROMIUM, TOTAL	13.4	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCB4	N	5.0	MG_KG	COPPER	22.1	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCB4	N	5.0	MG_KG	LEAD	7.91	J
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCB4	N	1.0	MG_KG	MERCURY	0.037	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCB4	N	5.0	MG_KG	SILVER	0.067	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCB4	N	5.0	MG_KG	ZINC	42.5	
OPERABLE UNIT B - MARINE	OUBMCB5	Intertidal	0-10 cm	20150518	OUBMCB5	N	5.0	MG_KG	ARSENIC	1.40	
OPERABLE UNIT B - MARINE	OUBMCB5	Intertidal	0-10 cm	20150518	OUBMCB5	N	5.0	MG_KG	CADMIUM	0.104	
OPERABLE UNIT B - MARINE	OUBMCB5	Intertidal	0-10 cm	20150518	OUBMCB5	N	5.0	MG_KG	CHROMIUM, TOTAL	8.44	
OPERABLE UNIT B - MARINE	OUBMCB5	Intertidal	0-10 cm	20150518	OUBMCB5	N	5.0	MG_KG	COPPER	33.3	
OPERABLE UNIT B - MARINE	OUBMCB5	Intertidal	0-10 cm	20150518	OUBMCB5	N	5.0	MG_KG	LEAD	5.91	J
OPERABLE UNIT B - MARINE	OUBMCB5	Intertidal	0-10 cm	20150518	OUBMCB5	N	1.0	MG_KG	MERCURY	0.037	
OPERABLE UNIT B - MARINE	OUBMCB5	Intertidal	0-10 cm	20150518	OUBMCB5	N	5.0	MG_KG	SILVER	0.045	
OPERABLE UNIT B - MARINE	OUBMCB5	Intertidal	0-10 cm	20150518	OUBMCB5	N	5.0	MG_KG	ZINC	36.4	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCBFD	FD	5.0	MG_KG	ARSENIC	1.99	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCBFD	FD	5.0	MG_KG	CADMIUM	0.248	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCBFD	FD	5.0	MG_KG	CHROMIUM, TOTAL	9.93	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCBFD	FD	5.0	MG_KG	COPPER	22.3	

Data Summary

Installation: BREMERTON_NS **Sampling Company:** URS, INC. **Task-Phase:** 0087 - **Lab:** ALS KELSO ENVIRONMENTAL LABORATORY

Matrix Type: Marine Sediment

Analytical Method: 6020 **Method Class:** Metals

Site ID	Location ID	Loc Type	Depth Range	Sample Date	Sample ID	Sample Type	Dilution Factor	Unit of Measure	Analyte Name	Analysis Value	Data Qual
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCBFD	FD	5.0	MG_KG	LEAD	9.58	J
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCBFD	FD	1.0	MG_KG	MERCURY	0.051	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCBFD	FD	5.0	MG_KG	SILVER	0.065	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCBFD	FD	5.0	MG_KG	ZINC	36.8	

Data Summary

Installation: BREMERTON_NS **Sampling Company:** URS, INC. **Task-Phase:** 0087 - **Lab:** ALS KELSO ENVIRONMENTAL LABORATORY

Matrix Type: Marine Sediment

Analytical Method: 8082A **Method Class:** PCBs

Site ID	Location ID	Loc Type	Depth Range	Sample Date	Sample ID	Sample Type	Dilution Factor	Unit of Measure	Analyte Name	Analysis Value	Data Qual
OPERABLE UNIT B - MARINE	CB6	Subtidal	0-10 cm	20140929	CB6-20140929	N	1	UG_KG	AROCLOR-1016	11	U
OPERABLE UNIT B - MARINE	CB6	Subtidal	0-10 cm	20140929	CB6-20140929	N	1	UG_KG	AROCLOR-1221	15	U
OPERABLE UNIT B - MARINE	CB6	Subtidal	0-10 cm	20140929	CB6-20140929	N	1	UG_KG	AROCLOR-1232	23	U
OPERABLE UNIT B - MARINE	CB6	Subtidal	0-10 cm	20140929	CB6-20140929	N	1	UG_KG	AROCLOR-1242	16	U
OPERABLE UNIT B - MARINE	CB6	Subtidal	0-10 cm	20140929	CB6-20140929	N	1	UG_KG	AROCLOR-1248	11	U
OPERABLE UNIT B - MARINE	CB6	Subtidal	0-10 cm	20140929	CB6-20140929	N	1	UG_KG	AROCLOR-1254	30	U
OPERABLE UNIT B - MARINE	CB6	Subtidal	0-10 cm	20140929	CB6-20140929	N	1	UG_KG	AROCLOR-1260	140	U
OPERABLE UNIT B - MARINE	CB6	Subtidal	0-10 cm	20140929	CB6-20140929	N	1	UG_KG	AROCLOR-1268	38	U
OPERABLE UNIT B - MARINE	OUBMCB1	Intertidal	0-10 cm	20150518	OUBMCB1	N	1	UG_KG	AROCLOR-1016	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB1	Intertidal	0-10 cm	20150518	OUBMCB1	N	1	UG_KG	AROCLOR-1221	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB1	Intertidal	0-10 cm	20150518	OUBMCB1	N	1	UG_KG	AROCLOR-1232	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB1	Intertidal	0-10 cm	20150518	OUBMCB1	N	1	UG_KG	AROCLOR-1242	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB1	Intertidal	0-10 cm	20150518	OUBMCB1	N	1	UG_KG	AROCLOR-1248	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB1	Intertidal	0-10 cm	20150518	OUBMCB1	N	1	UG_KG	AROCLOR-1254	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB1	Intertidal	0-10 cm	20150518	OUBMCB1	N	1	UG_KG	AROCLOR-1260	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB1	Intertidal	0-10 cm	20150518	OUBMCB1	N	1	UG_KG	AROCLOR-1268	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB2	Intertidal	0-10 cm	20150518	OUBMCB2	N	1	UG_KG	AROCLOR-1016	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB2	Intertidal	0-10 cm	20150518	OUBMCB2	N	1	UG_KG	AROCLOR-1221	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB2	Intertidal	0-10 cm	20150518	OUBMCB2	N	1	UG_KG	AROCLOR-1232	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB2	Intertidal	0-10 cm	20150518	OUBMCB2	N	1	UG_KG	AROCLOR-1242	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB2	Intertidal	0-10 cm	20150518	OUBMCB2	N	1	UG_KG	AROCLOR-1248	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB2	Intertidal	0-10 cm	20150518	OUBMCB2	N	1	UG_KG	AROCLOR-1254	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB2	Intertidal	0-10 cm	20150518	OUBMCB2	N	1	UG_KG	AROCLOR-1260	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB2	Intertidal	0-10 cm	20150518	OUBMCB2	N	1	UG_KG	AROCLOR-1268	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB3	Intertidal	0-10 cm	20150518	OUBMCB3	N	1	UG_KG	AROCLOR-1016	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB3	Intertidal	0-10 cm	20150518	OUBMCB3	N	1	UG_KG	AROCLOR-1221	4.3	U

Data Summary

Installation: BREMERTON_NS **Sampling Company:** URS, INC. **Task-Phase:** 0087 - **Lab:** ALS KELSO ENVIRONMENTAL LABORATORY

Matrix Type: Marine Sediment

Analytical Method: 8082A **Method Class:** PCBs

Site ID	Location ID	Loc Type	Depth Range	Sample Date	Sample ID	Sample Type	Dilution Factor	Unit of Measure	Analyte Name	Analysis Value	Data Qual
OPERABLE UNIT B - MARINE	OUBMCB3	Intertidal	0-10 cm	20150518	OUBMCB3	N	1	UG_KG	AROCLOR-1232	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB3	Intertidal	0-10 cm	20150518	OUBMCB3	N	1	UG_KG	AROCLOR-1242	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB3	Intertidal	0-10 cm	20150518	OUBMCB3	N	1	UG_KG	AROCLOR-1248	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB3	Intertidal	0-10 cm	20150518	OUBMCB3	N	1	UG_KG	AROCLOR-1254	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB3	Intertidal	0-10 cm	20150518	OUBMCB3	N	1	UG_KG	AROCLOR-1260	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB3	Intertidal	0-10 cm	20150518	OUBMCB3	N	1	UG_KG	AROCLOR-1268	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCB4	N	1	UG_KG	AROCLOR-1016	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCB4	N	1	UG_KG	AROCLOR-1221	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCB4	N	1	UG_KG	AROCLOR-1232	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCB4	N	1	UG_KG	AROCLOR-1242	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCB4	N	1	UG_KG	AROCLOR-1248	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCB4	N	1	UG_KG	AROCLOR-1254	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCB4	N	1	UG_KG	AROCLOR-1260	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCB4	N	1	UG_KG	AROCLOR-1268	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB5	Intertidal	0-10 cm	20150518	OUBMCB5	N	1	UG_KG	AROCLOR-1016	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB5	Intertidal	0-10 cm	20150518	OUBMCB5	N	1	UG_KG	AROCLOR-1221	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB5	Intertidal	0-10 cm	20150518	OUBMCB5	N	1	UG_KG	AROCLOR-1232	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB5	Intertidal	0-10 cm	20150518	OUBMCB5	N	1	UG_KG	AROCLOR-1242	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB5	Intertidal	0-10 cm	20150518	OUBMCB5	N	1	UG_KG	AROCLOR-1248	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB5	Intertidal	0-10 cm	20150518	OUBMCB5	N	1	UG_KG	AROCLOR-1254	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB5	Intertidal	0-10 cm	20150518	OUBMCB5	N	1	UG_KG	AROCLOR-1260	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB5	Intertidal	0-10 cm	20150518	OUBMCB5	N	1	UG_KG	AROCLOR-1268	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCBFD	FD	1	UG_KG	AROCLOR-1016	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCBFD	FD	1	UG_KG	AROCLOR-1221	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCBFD	FD	1	UG_KG	AROCLOR-1232	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCBFD	FD	1	UG_KG	AROCLOR-1242	4.3	U

Data Summary

Installation: BREMERTON_NS **Sampling Company:** URS, INC. **Task-Phase:** 0087 - **Lab:** ALS KELSO ENVIRONMENTAL LABORATORY

Matrix Type: Marine Sediment

Analytical Method: 8082A **Method Class:** PCBs

Site ID	Location ID	Loc Type	Depth Range	Sample Date	Sample ID	Sample Type	Dilution Factor	Unit of Measure	Analyte Name	Analysis Value	Data Qual
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCBFD	FD	1	UG_KG	AROCLOR-1248	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCBFD	FD	1	UG_KG	AROCLOR-1254	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCBFD	FD	1	UG_KG	AROCLOR-1260	4.3	U
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCBFD	FD	1	UG_KG	AROCLOR-1268	4.3	U

Data Summary

Installation: BREMERTON_NS **Sampling Company:** URS, INC. **Task-Phase:** 0087 - **Lab:** ALS KELSO ENVIRONMENTAL LABORATORY

Matrix Type: Marine Sediment

Analytical Method: PS-PSEP **Method Class:** Physical Characteristics

Site ID	Location ID	Loc Type	Depth Range	Sample Date	Sample ID	Sample Type	Dilution Factor	Unit of Measure	Analyte Name	Analysis Value	Data Qual
OPERABLE UNIT B - MARINE	CB6	Subtidal	0-10 cm	20140929	CB6-20140929	N	1	PCT	PERCENT GRAVEL	45.14	
OPERABLE UNIT B - MARINE	CB6	Subtidal	0-10 cm	20140929	CB6-20140929	N	1	PCT	PERCENT SAND, VERY COARSE	3.69	
OPERABLE UNIT B - MARINE	CB6	Subtidal	0-10 cm	20140929	CB6-20140929	N	1	PCT	PERCENT SAND, COARSE	6.94	
OPERABLE UNIT B - MARINE	CB6	Subtidal	0-10 cm	20140929	CB6-20140929	N	1	PCT	PERCENT SAND, MEDIUM	5.42	
OPERABLE UNIT B - MARINE	CB6	Subtidal	0-10 cm	20140929	CB6-20140929	N	1	PCT	PERCENT SAND, FINE	6.01	
OPERABLE UNIT B - MARINE	CB6	Subtidal	0-10 cm	20140929	CB6-20140929	N	1	PCT	PERCENT SAND, VERY FINE	3.7	
OPERABLE UNIT B - MARINE	CB6	Subtidal	0-10 cm	20140929	CB6-20140929	N	1	PCT	PERCENT SILT	22.18	
OPERABLE UNIT B - MARINE	CB6	Subtidal	0-10 cm	20140929	CB6-20140929	N	1	PCT	PERCENT CLAY	9.08	
OPERABLE UNIT B - MARINE	CB6	Subtidal	0-10 cm	20140929	CB6-20140929	N	1	PCT	TOTAL ORGANIC CARBON	2.71	
OPERABLE UNIT B - MARINE	CB6	Subtidal	0-10 cm	20140929	CB6-20140929	N	1	PCT	TOTAL SOLIDS	46.5	
OPERABLE UNIT B - MARINE	OUBMCB1	Intertidal	0-10 cm	20150518	OUBMCB1	N	1	PCT	PERCENT GRAVEL	78.33	
OPERABLE UNIT B - MARINE	OUBMCB1	Intertidal	0-10 cm	20150518	OUBMCB1	N	1	PCT	PERCENT SAND, VERY COARSE	3.06	
OPERABLE UNIT B - MARINE	OUBMCB1	Intertidal	0-10 cm	20150518	OUBMCB1	N	1	PCT	PERCENT SAND, COARSE	0.99	
OPERABLE UNIT B - MARINE	OUBMCB1	Intertidal	0-10 cm	20150518	OUBMCB1	N	1	PCT	PERCENT SAND, MEDIUM	1.44	
OPERABLE UNIT B - MARINE	OUBMCB1	Intertidal	0-10 cm	20150518	OUBMCB1	N	1	PCT	PERCENT SAND, FINE	3.50	
OPERABLE UNIT B - MARINE	OUBMCB1	Intertidal	0-10 cm	20150518	OUBMCB1	N	1	PCT	PERCENT SAND, VERY FINE	3.35	
OPERABLE UNIT B - MARINE	OUBMCB1	Intertidal	0-10 cm	20150518	OUBMCB1	N	1	PCT	PERCENT SILT	4.84	
OPERABLE UNIT B - MARINE	OUBMCB1	Intertidal	0-10 cm	20150518	OUBMCB1	N	1	PCT	PERCENT CLAY	3.31	
OPERABLE UNIT B - MARINE	OUBMCB1	Intertidal	0-10 cm	20150518	OUBMCB1	N	1	PCT	TOTAL ORGANIC CARBON	1.70	
OPERABLE UNIT B - MARINE	OUBMCB1	Intertidal	0-10 cm	20150518	OUBMCB1	N	1	PCT	TOTAL SOLIDS	77.1	
OPERABLE UNIT B - MARINE	OUBMCB2	Intertidal	0-10 cm	20150518	OUBMCB2	N	1	PCT	PERCENT GRAVEL	54.17	
OPERABLE UNIT B - MARINE	OUBMCB2	Intertidal	0-10 cm	20150518	OUBMCB2	N	1	PCT	PERCENT SAND, VERY COARSE	7.07	
OPERABLE UNIT B - MARINE	OUBMCB2	Intertidal	0-10 cm	20150518	OUBMCB2	N	1	PCT	PERCENT SAND, COARSE	6.33	
OPERABLE UNIT B - MARINE	OUBMCB2	Intertidal	0-10 cm	20150518	OUBMCB2	N	1	PCT	PERCENT SAND, MEDIUM	10.71	
OPERABLE UNIT B - MARINE	OUBMCB2	Intertidal	0-10 cm	20150518	OUBMCB2	N	1	PCT	PERCENT SAND, FINE	12.14	
OPERABLE UNIT B - MARINE	OUBMCB2	Intertidal	0-10 cm	20150518	OUBMCB2	N	1	PCT	PERCENT SAND, VERY FINE	2.71	

Data Summary

Installation: BREMERTON_NS **Sampling Company:** URS, INC. **Task-Phase:** 0087 - **Lab:** ALS KELSO ENVIRONMENTAL LABORATORY

Matrix Type: Marine Sediment

Analytical Method: PS-PSEP **Method Class:** Physical Characteristics

Site ID	Location ID	Loc Type	Depth Range	Sample Date	Sample ID	Sample Type	Dilution Factor	Unit of Measure	Analyte Name	Analysis Value	Data Qual
OPERABLE UNIT B - MARINE	OUBMCB2	Intertidal	0-10 cm	20150518	OUBMCB2	N	1	PCT	PERCENT SILT	1.49	
OPERABLE UNIT B - MARINE	OUBMCB2	Intertidal	0-10 cm	20150518	OUBMCB2	N	1	PCT	PERCENT CLAY	1.39	
OPERABLE UNIT B - MARINE	OUBMCB2	Intertidal	0-10 cm	20150518	OUBMCB2	N	1	PCT	TOTAL ORGANIC CARBON	0.325	
OPERABLE UNIT B - MARINE	OUBMCB2	Intertidal	0-10 cm	20150518	OUBMCB2	N	1	PCT	TOTAL SOLIDS	87.8	
OPERABLE UNIT B - MARINE	OUBMCB3	Intertidal	0-10 cm	20150518	OUBMCB3	N	1	PCT	PERCENT GRAVEL	46.19	
OPERABLE UNIT B - MARINE	OUBMCB3	Intertidal	0-10 cm	20150518	OUBMCB3	N	1	PCT	PERCENT SAND, VERY COARSE	7.67	
OPERABLE UNIT B - MARINE	OUBMCB3	Intertidal	0-10 cm	20150518	OUBMCB3	N	1	PCT	PERCENT SAND, COARSE	7.00	
OPERABLE UNIT B - MARINE	OUBMCB3	Intertidal	0-10 cm	20150518	OUBMCB3	N	1	PCT	PERCENT SAND, MEDIUM	17.32	
OPERABLE UNIT B - MARINE	OUBMCB3	Intertidal	0-10 cm	20150518	OUBMCB3	N	1	PCT	PERCENT SAND, FINE	15.65	
OPERABLE UNIT B - MARINE	OUBMCB3	Intertidal	0-10 cm	20150518	OUBMCB3	N	1	PCT	PERCENT SAND, VERY FINE	2.68	
OPERABLE UNIT B - MARINE	OUBMCB3	Intertidal	0-10 cm	20150518	OUBMCB3	N	1	PCT	PERCENT SILT	1.20	
OPERABLE UNIT B - MARINE	OUBMCB3	Intertidal	0-10 cm	20150518	OUBMCB3	N	1	PCT	PERCENT CLAY	1.16	
OPERABLE UNIT B - MARINE	OUBMCB3	Intertidal	0-10 cm	20150518	OUBMCB3	N	1	PCT	TOTAL ORGANIC CARBON	0.254	
OPERABLE UNIT B - MARINE	OUBMCB3	Intertidal	0-10 cm	20150518	OUBMCB3	N	1	PCT	TOTAL SOLIDS	79.2	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCB4	N	1	PCT	PERCENT GRAVEL	73.98	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCB4	N	1	PCT	PERCENT SAND, VERY COARSE	7.11	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCB4	N	1	PCT	PERCENT SAND, COARSE	6.08	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCB4	N	1	PCT	PERCENT SAND, MEDIUM	5.15	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCB4	N	1	PCT	PERCENT SAND, FINE	2.24	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCB4	N	1	PCT	PERCENT SAND, VERY FINE	1.23	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCB4	N	1	PCT	PERCENT SILT	1.55	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCB4	N	1	PCT	PERCENT CLAY	1.39	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCB4	N	1	PCT	TOTAL ORGANIC CARBON	0.267	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCB4	N	1	PCT	TOTAL SOLIDS	85.5	
OPERABLE UNIT B - MARINE	OUBMCB5	Intertidal	0-10 cm	20150518	OUBMCB5	N	1	PCT	PERCENT GRAVEL	75.53	
OPERABLE UNIT B - MARINE	OUBMCB5	Intertidal	0-10 cm	20150518	OUBMCB5	N	1	PCT	PERCENT SAND, VERY COARSE	6.49	

Data Summary

Installation: BREMERTON_NS **Sampling Company:** URS, INC. **Task-Phase:** 0087 - **Lab:** ALS KELSO ENVIRONMENTAL LABORATORY

Matrix Type: Marine Sediment

Analytical Method: PS-PSEP **Method Class:** Physical Characteristics

Site ID	Location ID	Loc Type	Depth Range	Sample Date	Sample ID	Sample Type	Dilution Factor	Unit of Measure	Analyte Name	Analysis Value	Data Qual
OPERABLE UNIT B - MARINE	OUBMCB5	Intertidal	0-10 cm	20150518	OUBMCB5	N	1	PCT	PERCENT SAND, COARSE	7.85	
OPERABLE UNIT B - MARINE	OUBMCB5	Intertidal	0-10 cm	20150518	OUBMCB5	N	1	PCT	PERCENT SAND, MEDIUM	5.53	
OPERABLE UNIT B - MARINE	OUBMCB5	Intertidal	0-10 cm	20150518	OUBMCB5	N	1	PCT	PERCENT SAND, FINE	1.80	
OPERABLE UNIT B - MARINE	OUBMCB5	Intertidal	0-10 cm	20150518	OUBMCB5	N	1	PCT	PERCENT SAND, VERY FINE	1.05	
OPERABLE UNIT B - MARINE	OUBMCB5	Intertidal	0-10 cm	20150518	OUBMCB5	N	1	PCT	PERCENT SILT	1.29	
OPERABLE UNIT B - MARINE	OUBMCB5	Intertidal	0-10 cm	20150518	OUBMCB5	N	1	PCT	PERCENT CLAY	1.05	
OPERABLE UNIT B - MARINE	OUBMCB5	Intertidal	0-10 cm	20150518	OUBMCB5	N	1	PCT	TOTAL ORGANIC CARBON	0.185	
OPERABLE UNIT B - MARINE	OUBMCB5	Intertidal	0-10 cm	20150518	OUBMCB5	N	1	PCT	TOTAL SOLIDS	91.3	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCBFD	FD	1	PCT	PERCENT GRAVEL	73.76	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCBFD	FD	1	PCT	PERCENT SAND, VERY COARSE	5.91	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCBFD	FD	1	PCT	PERCENT SAND, COARSE	5.51	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCBFD	FD	1	PCT	PERCENT SAND, MEDIUM	4.63	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCBFD	FD	1	PCT	PERCENT SAND, FINE	2.20	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCBFD	FD	1	PCT	PERCENT SAND, VERY FINE	1.27	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCBFD	FD	1	PCT	PERCENT SILT	1.82	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCBFD	FD	1	PCT	PERCENT CLAY	1.33	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCBFD	FD	1	PCT	TOTAL ORGANIC CARBON	0.249	
OPERABLE UNIT B - MARINE	OUBMCB4	Intertidal	0-10 cm	20150518	OUBMCBFD	FD	1	PCT	TOTAL SOLIDS	86.1	

APPENDIX B

Supporting Materials:

Field Duplicate Summary
Data Quality Assessment
Responses to Stakeholder Comments on Draft Phase 2 LTM Report

Field Duplicate Summary

Summary of Field Duplicates from 2014 OU B Marine Phase 2 Long-term Monitoring

Location	Sample Type	% Fines (clay + silt)	TOC (%)	Total PCBs - bulk (µg/kg) (ug/kg)	RPD (%)	Total PCBs - normalized (mg/kgOC) (mg/kgOC)	RPD (%)	Arsenic (mg/kg) (mg/kg)	RPD (%)	Cadmium (mg/kg) (mg/kg)	RPD (%)	Chromium (mg/kg) (mg/kg)	RPD (%)	Copper (mg/kg) (mg/kg)	RPD (%)	Lead (mg/kg) (mg/kg)	RPD (%)	Mercury (mg/kg) (mg/kg)	RPD (%)	Nickel (mg/kg) (mg/kg)	RPD (%)	Zinc (mg/kg) (mg/kg)	RPD (%)
CB-4	ES	3.0	0.27	2.1 U		1.9*		2.5		0.21		13		22		7.9 J		0.037		0.067		42	
	FD	3.2	0.25	2.1 U	0.0%	1.8*	---	2.0	22%	0.25	17%	9.9	27%	22	0%	9.6 J	19%	0.051	32%	0.065	3%	37	13%

ES = primary environmental sample
FD = field duplicate
* TOC value is outside the acceptable range for carbon-normalization of PCBs
U = undetected value
J = estimated value
RPD = relative percent difference

5/16/16 3:15 PM

Puget Sound Naval Shipyard Superfund Site, OU B Marine

2014 Sinclair Inlet Phase 2 Long-term Monitoring Data Quality Assessment

1.0 SAMPLING RESULTS

This data quality assessment describes the results of sediment and tissue sampling conducted in May 2015 at the Bremerton Naval Complex. A single subtidal sediment sample collected in September 2014 during the Phase 1 monitoring will also be discussed. This sample was reported in the 2014 OU B Marine Phase 1 Long-Term Monitoring Report (U.S. Navy 2016); however, the results of the data validation associated with this sample are presented here for completeness. Samples were analyzed by ALS Environmental Services, Incorporated located in Kelso, Washington for polychlorinated biphenyls (PCBs) by EPA Method 8082A, metals by EPA Methods 6020A (arsenic, cadmium, chromium, copper, lead, silver, and zinc), mercury by EPA Methods 7470A/B (sediment)/7471A (water), total organic carbon (TOC) by Puget Sound Estuary Program methodology, and/or total lipids by EPA Method 3540/U.S. Department of Commerce National Oceanic and Atmospheric Administration (NOAA) methodology. Validation of the sample results was conducted by Pyron Environmental in Olympia, Washington and followed the objectives described in *2014 Operable Unit B Marine Long-Term Monitoring Plan, Bremerton Naval Complex, Bremerton, Washington*, dated September 12, 2014.

1.1 SEDIMENT AND TISSUE ANALYTICAL RESULTS

1.1.1 Sediment and Tissue Data Quality Assessment

For sediment and tissue sample results, the data validation reports concluded that the reported data are of known quality and acceptable for use, as qualified.

Data were assessed according to the following criteria:

- Sample Management:
    - Several cooler temperatures associated with the 2014 sediment sampling exceeded the EPA-recommended limits of 4°C±2°C. Samples were in transit to the laboratory for less than 24 hours and the required analytes are not temperature-sensitive. Data qualifiers were not assigned and data quality was not impacted by the cooler temperature exceedances.
    - All sediment and tissue samples were prepared and analyzed within the method-required holding times.
- Instrument Tunes (applicable to ICP-MS analysis only) – Acceptable
- Initial Calibrations – Acceptable except as noted below:
    - The percent difference (%D) for Aroclor 1260 on one of the analytical columns in the initial calibration verification associated with the tissue samples was outside the method criteria. The continuing calibration verifications associated directly with the tissue samples were acceptable and data were not qualified based on this initial calibration verification result.
- Continuing Calibration Verifications – Acceptable except as noted below:
    - The %D for Aroclor 1016 exceeded the method limit on one of the analytical columns in one continuing calibration verification associated with the tissue samples. Aroclor 1016 was reported as not detected in the samples associated with this continuing calibration verification; therefore, data were not qualified based on this continuing calibration verification result.
- ICP Interference Check Samples - Acceptable
- Blanks – Acceptable except as noted below:

    - Copper, lead, and/or zinc were detected in one or more method blanks associated with the sediment samples. The concentrations for copper, lead, and zinc were significantly higher (greater than ten times) in the samples associated with these method blanks; therefore, data were not qualified based on these method blank results.
    - Compounds of concern were not detected in the associated field or instrument blanks.

- Laboratory Control Samples, Laboratory Control Sample Duplicates and/or Standard Reference Materials – Acceptable where applicable
- Surrogates (applicable to PCB analysis only) – Acceptable except as noted below:
    - The percent recovery for decachlorobiphenyl was below the control limits in the tissue sample SI-ESM05 B. The results for all Aroclors in this sample were qualified as estimated and flagged 'J' or 'UJ.'
- Matrix Spike/Matrix Spike Duplicates (MS/MSDs) – Acceptable except as noted below:
    - The percent recoveries for chromium, copper, lead, and zinc were outside the control limits in the MS/MSD performed using sediment sample CB6-20140929. The results for chromium, copper, lead, and zinc in this sample were qualified as estimated and flagged 'J.'
    - The percent recovery for lead in the MSD was outside the control limits in the MSD performed using sediment sample OUBMCB2. The results for lead in OUBMCB1, OUBMCB2, OUBMCB3, OUBMCB4, the field duplicate collected at OUBMCB4, and OUBMCB5 were qualified as estimated and flagged 'J.'
- Serial Dilutions (applicable to metals analysis only) – Acceptable
- Internal Standards (applicable to metals analysis only) – Acceptable
- Laboratory Replicates – Acceptable where applicable
- Field duplicates – Acceptable
- Compound Identification – Acceptable except as noted below:
    - Sample-specific limits of quantitation in one or more sediment and/or tissue samples were adjusted for sample size, dilutions, interference from non-target matrix interferences, and/or the percent moisture content of the samples. These limits of quantitation adjustments were supported with appropriate initial calibration concentrations.
    - The relative percent differences for Aroclor 1254 (tissue samples SI-ESM01 B, SI-ESM02 B, and SI-ESM06 B) and Aroclor 1260 (tissue samples SI-ESM01 B and SI-ESM03 B) between the two analytical columns were more than the method limit of 40%. The results for Aroclor 1254 and/or Aroclor 1260 were flagged 'J' in these samples.
    - The limits of quantitation for one or more Aroclors were significantly elevated in subtidal sediment sample CB-6 due to matrix interferences, likely petroleum hydrocarbon or biogenic in nature. The elevated limits of quantitation do not limit the data usability, but do impact the use of this data for regulatory comparison.
- Target compound identification – Acceptable

Summary of Data Qualifiers and Impact on Sample Results

Field Sample ID	Analyte	Assigned Qualifier	Reason	Impact (bias)
CB6-20140929	Chromium Copper Lead Zinc	J J J J	MS/MSD %Rs and/or RPD > UCL	High
OUBMCB1 OUBMCB2 OUBMCB3 OUBMCB4 OUBMCBFD* OUBMCB5	Lead	J J J J J J	MSD %R value was >UCL	High
SI-ESM05 B	Aroclor-1016 Aroclor-1221 Aroclor-1232 Aroclor-1242 Aroclor-1248 Aroclor-1254 Aroclor-1260 Aroclor-1268	UJ UJ UJ UJ UJ J J UJ	Surrogate spike %R was <LCL	Low
SI-ESM01 B SI-ESM02 B SI-ESM06 B	Aroclor-1254	J	Dual column RPD was >40%	High
SI-ESM01 B SI-ESM03 B	Aroclor-1260	J	Dual column RPD was >40%	High

* Field duplicate collected at OUBMCB4
J – The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
LCL – lower control limit
MS/MSD – matrix spike/matrix spike duplicate
%R – percent recovery
RPD – relative percent difference
UCL – upper control limit
UJ – The analyte was not deemed above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

1.1.2 Data Quality Conclusions

The independent data validator and the URS project chemist assessed the Phase 2 analytical data for precision, accuracy, completeness, representativeness, and comparability. Precision and accuracy were evaluated based on field and laboratory analytical quality control parameters. Out of a total of 74 individual Aroclor and metals detections 17, or 23 percent, were qualified as estimated. As detailed in Section 1.1.1, in general all data are acceptable for use, and no serious quality control criteria exceedances were observed. All planned sediment samples were collected. However, only a total of 117 individual English sole were collected rather than the 200 that were planned. The goal was to prepare a total of 10 20-fish composite samples. Instead 3 20-fish and 3 19-fish composites were prepared. All analytical data are acceptable for use as qualified (i.e., no data were rejected during validation), so the completeness of the sediment samples is 100 percent but completeness for the English sole samples is only about 60 percent based on the number of samples collected. Representativeness of the data is determined to be acceptable and compliant with the sampling design. The comparability of laboratory data was assessed by the use of laboratories that hold DoD Environmental Laboratory Approval Program certifications, which require standardization of laboratory quality assurance and quality control programs. Comparability of the Phase 2 data was determined to be acceptable, as the sediment samples were intended to be used only for a one-time characterization of intertidal and subtidal conditions rather than for comparison to other LTM data and the shortfall in English sole samples is acceptable because these data are not required to support any critical decisionmaking.

Navy Responses to Stakeholder Comments on

Draft OU B Marine Phase 2 LTM Report

Document Title: Draft 2014 OU B Marine Phase 2 LTM Report dated May 19, 2016
Proposed Responses dated: November 10, 2016

Comments from: Karen Keeley, EPA dated May 26, 2016

#	Page No./ Para No.	Comment	Proposed Response	Response Accepted?
1	p. iii	Clarify when samples were collected (either here or below)	The text was revised to: "The last two components of the 2014 monitoring, which are the subject of this report, were sampling of subtidal sediment near Charleston Beach at the southwest end of BNC in September 2014 and intertidal sediments at Charleston Beach in May 2015 and sampling of English sole from central Sinclair Inlet in May 2015."	Yes.
2	p. iv	Add a note under the table indicating that these data are five intertidal (May 2015; CB-1 through CB-5) and one subtidal (month? 2014; CB-6) sample results.	The following note was added to the table: "A total of six sediment samples were collected, one subtidal sample collected in September 2014 and five intertidal samples collected in May 2015." See attached revised tables.	Yes.
3	p. iv	Fix text wrap.	The text will be adjusted.	Yes.
4	p. iv	Confirm with Ecology, but I thought the new regs changed SQS to SCO. If so, change note under table also.	"SCO" was substituted for "SQS" throughout the report.	Yes.
5	p. iv	This seems like a high U value for PCBs – is there a reason it is high? Should they have run a dilution? Did it meet MDL reqt's?	This is a comparatively high nondetect value. This reported result did not meet the MDL requirement. Review of the data package by our chemists revealed that the lab recorded that matrix interferences hindered Aroclor identification and quantification. The lab performed an overnight florisil cleanup and reanalyzed the sample. Unfortunately the cleanup did not eliminate the matrix interference. The lab reported the original result with elevated reporting limits. Footnotes	Yes.

Document Title: Draft 2014 OU B Marine Phase 2 LTM Report dated May 19, 2016
Proposed Responses dated: November 10, 2016

#	Page No./ Para No.	Comment	Proposed Response	Response Accepted?
			were added to Tables ES-1 and 3-1 to briefly clarify this and the DQA in Appendix B was revised to discuss this elevated detection limit.	
6	p. iv	Wouldn't you want to footnote this clarifying that all PCBs were undetected and this mean value represents a mean based on using the sums of the full U value (not ½ DL as is sometimes used) for each reported Aroclor. From text below, it seems that for each sample the full U value was summed. Otherwise, someone might use this number assuming it was actually a detected value.	The average of the non-detect values were removed from the table.	Yes.
7	p. v	Add a note under table indicating that these are three 20-fish composite samples and three 19-fish composites.	The following note was added to the table: "A total of six English sole samples were prepared; three 20-fish composites and three 19-fish composites."	Yes.
8	p. xii	It seems this should be SCO?	"SCO" was substituted for "SQS" in the list of abbreviations.	Yes.
9	p. 1-2	Insert new text? ", referred to as Charleston Beach,	The text was revised to identify this as Charleston Beach.	Yes.
10	p. 1-2	I am not reviewing this section as I assume it is consistent with previously-accepted language.	Comment noted. No changes are necessary to resolve this comment.	Yes.
11	p. 2-2	Ellen – I just wanted to note that we are still waiting to get the info on the CAD re: part of the CAD (where the 'extra' material had to be placed) is on DNR land – you were going to check into this as	No changes are planned on the basis of this comment.	Yes.

Document Title: Draft 2014 OU B Marine Phase 2 LTM Report dated May 19, 2016
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		part of the ICs is my recollection. Update: I now see this is described in detail below; I think the resolution of whether this DNR area has been included in the IC for the site has not been resolved yet. At least that's my recollection.		
12	p. 3-12	Incorporate any relevant comments that EPA made on Table ES-1 of this report into this Table 3-1.	Table 3-1 and ES-1 were reconciled.	Yes.
13	p. 3-12	Table ES-1 uses 2.1 U. Sig digits should be the same.	The tables were modified to be consistent. Note that as shown in the response to comment #16 below, the detection limit was changed to 4.3 U.	Yes.
14	p. 3-12	SCO?	"SQS" was replaced with "SCO."	Yes.
15	p. 5-1	Review of Data Summary: 1) In the Data Summary, the results shown below are for 'animal tissue' but there are columns that label the data as "subtidal" and 0-10 cm" which seems very confusing – is there a reason for this? I didn't compare the data to the tables, but perhaps another reviewer will do that.	The data summary was revised.	Yes.

Comments from: Raymond Wu, EPA dated June 3, 2016 and June 6, 2016

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16		I am wondering how your contractor defines the "Fines".	"Fines" are defined as the sum of Clay and Silt. The headings of Tables ES-1 and 3-1 were modified to show this. A more detailed explanation was provided to the EPA chemist who posed this question.	Yes.
17	p. 3-12	Could you please also check the 3rd column from the left, labelled PCB (µg/kg), in Table 3-1? Shouldn't it be 4U instead of 2U?	The non-detects shown in Table 3-1 as "2 U" were changed to "4.3 U".	Yes.

Comments from: John Evered, Ecology dated June 16

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18	p. iii	Which parts of the sampling were conducted in 2015? Please be more specific.	See response to comment 1 above.	Yes.
19	p. iv	Correct use per 2013 revision is SCO/CSL - Washington State sediment cleanup objective/ cleanup screening level. This should be changed throughout the document.	"SCO" will be substituted for "SQS" throughout the report. Footnotes were added to Tables ES-1 and 3-1 to clarify this.	Yes.
20	p. iv	12/65 mg/kgOC, see promulgated standards, chapter 8 of SCUM	Tables ES-1 and 3-1 were revised to show 12/65 mg/kgOC.	Yes.

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21	p. xii	SCO – Washington State sediment quality objective.	"SCO" was substituted for "SQS" in the list of abbreviations.	Yes.
22	p. 3-5	Please expand on the reasons for why only 117 fish were collected.	The English sole collection was not performed by the Navy, nor was it performed under Navy direction. The text was revised to clarify that this was the total number of specimens of suitable length that happened to be collected during the PSEMP trawls in Sinclair Inlet.	Yes.
23	p. 3-5	In conjunction with the project team	This text was added.	Yes.

Comments from: Denice Taylor, Suquamish Tribe dated June 20, 2016

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24		**Comparison to SMS clean up levels:** The CB sediment data were analyzed for PCBs, mercury and other metals. The report states that a key finding is that none of the detected metals concentrations exceeded the state sediment cleanup objectives. I do not recall that the project team agreed that the SMS would serve as the metric for evaluating the CB data. The State's sediment standards are for the protection of benthic organisms only and while they are a valuable benchmark, they are not adequately protective of human health or	Tables ES-1 and 3-1 were modified as described.	Yes.

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		higher trophic level exposures. In the absence of risk-based screening levels for the site, it is suggested that the CB sediment data also be compared to natural background concentrations, as represented by the BOLD data set. Note that this approach has already been applied to mercury in the addendum to the 5-Year Review which was recently finalized. The comparison of mercury to natural background should also be included in this report.		
25		**Monitoring Objectives:** The report includes the objectives for the LTM program but does not clearly state the objectives for the collection of the CB sediment data, which was a modification or addition to the OU B Marine LTM. The Final 2014 OU B Marine LTM Plan (page 2-2) includes the following objectives for the CB sample collection: 1) providing information to support beach stabilization designs and 2) assessing whether landfill materials at Charleston Beach may be impacting the adjacent marine sediments. Section 3 of the draft	The following statement was added to the end of Section 2: "The objectives of the Charleston Beach sediment sampling were to provide information to support ongoing beach stabilization design work and to assess whether landfill materials are impacting the adjacent marine sediments."	Yes.

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		report would seem to be an appropriate place to include these objectives.		
26		**Intertidal sediment sample locations:** The 5 intertidal samples were to be collected at seeps located during a site visit and agreed to by the Tribe, Ecology and the Navy. Please provide a description of the approximate elevations of the intertidal samples and confirm that they were collected from the agreed to sample locations. Are there field notes regarding the seeps in relation to the sediment samples?	The field logbook mentions that Ellen Brown directed in the field that two samples be collected west of the wingwall at locations where seeps were visible. The following text was added to Subsection 3.3.1: "Latitude and longitude were recorded at the time of sampling, but not elevation. It is estimated based on the time of sampling and the predicted low tide at the time that the intertidal samples were collected from between -1.0 and -2.4 feet MLLW. The presence of seeps was recorded at locations CB-4 and CB-5, but not at the other three intertidal locations."	Yes.
27		**Organic Carbon Normalization for PCBs:** Section 3.2.4 explains that PCB concentrations are generally normalized for TOC, consistent with the WA SMS and standard practice. However, as presented in Table 3-1, the CB sediment samples demonstrated a low percentage of TOC. The table notes that the TOC values are outside the range generally accepted for normalizing PCBs, but this is not discussed in the text or in the context of interpreting the	The following statement will be added at the end of Section 3.2.4: "In practice, carbon normalization is not performed when the TOC values are below 0.5 percent or above 3.5 percent." The following statement will be added to the summary of the PCBs results in Section 3.3.1: "The TOC results were outside the range commonly used to normalize PCBs for four of the six samples, so only the bulk PCBs results are shown in Table 3-1 for these samples."	Yes.

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		results. In the table, it appears that the undetected results were carbon normalized, and compared to SMS levels, which would be inappropriate. Please revise the report to more fully explain the CB PCB sediment results and correct the table as necessary.		
28		**Detection/Quantitation Limits for PCBs:** PCBs are reported as undetected in all of the CB sediment data, at a detection or quantitation limit of 2 ug/kg for the intertidal samples and 140 ug/kg for the single subtidal sample. Please explain the adequacy of the detection/quantitation limit for PCB data that are not OC normalized. Why was the detection/quantitation limit different for the subtidal sample?	See response to Comment #5 above.	Yes.